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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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74-0514. Gratz, N. G. (Vector Biol. and Control, World Health Organization, 1211 Geneva 27, Switzerland). **A critical review of currently used single-dose rodenticides.** *Bull. WHO 48(4): 469-477; 1973.* (35 references)

The introduction of the anticoagulants in the early 1950s, with their much greater safety to nontarget animals, resulted in a general decline in the use of single-dose rodenticides. However, the appearance of rodent resistance to the anticoagulants, first in the United Kingdom, later elsewhere in Europe, and still more recently in the USA, has revived interest in the use of single-dose rodenticides. Unfortunately, owing to their danger to nontarget mammals, the use of several of these compounds must be restricted; others, despite their long use, are now recognized to be unsatisfactory because of their poor acceptance or reacceptance by rats and mice. Thus, only very few compounds of this type are available for unrestricted use and there is an urgent need for the development of effective alternatives. (Author abstract by permission)

74-0515. Looney, J. W.; McNabb, C. G.* (Dept. Agr. Econ., Univ. Missouri, Columbia, MO). **Some legal aspects of using pesticides.** *Crops Soils Mag. 26(2): 5-7; 1973.*

Doctrines of negligence and strict liability are used in legal disputes arising from pesticide damage. Once damage caused by a particular spray operation is proven, little evidence of careless conduct is needed for the court to rule negligence. Under strict liability, when a farmer is considered responsible for any damage resulting from the use of an unusually dangerous substance, the farmer should hire competent custom operators and include a written clause in the contract. This provides a compensation for any damages the landowner must pay as a result of the negligence of the operator. If pesticide use unreasonably interferes with the use or enjoyment of public or private property, a nuisance suit may be used. "Actual" damages must be paid and "punitive" damages may be required if the practice could be economically changed to eliminate the undesired effect. Criminal action may be brought about when state water pollution laws are violated.

74-0516. Burger, E. J., Jr. (Off. Sci. Technol., Executive Off. President, Washington, DC 20506). **Summary: Conference on Dibenzodioxins and Dibenzofurans, National Institute of Environmental Health Services, April 2-3, 1973.** *Environ. Health Perspect. 5: 279-282; 1973.* (2 references)

The Conference on Dibenzodioxins and Dibenzofurans was an early exchange of information being gathered on these compounds. A significant finding in the areas of chemistry, analysis, and chemical and physical properties concerned the formation of dioxins from precursors through condensation reactions. Most laboratory studies have suggested that decomposition, typically reduction, occurs more rapidly in the environment than does formation. Human data presented has been insufficient for a proper evaluation of the effects of these compounds. Structure-activity relationships, determined in animals, have shown that halogens on both benzene rings are necessary for toxic activity and that bromine confers more activity than chlorine. Considerable variation has been found in the susceptibility of animal species to the dioxins, but the major sites of action appear to be the liver, the hematopoietic system, and the lymphatic system. Absorption into the organism is primarily influenced by water and lipid solubility.

74-0517. Anonymous. **A strong case for DDT's return.** *Farm Chem. 136(11): 24, 26; 1973.*

With DDT banned, the tussock moth has infested more than 900,000 acres of timberland in the Pacific Northwest. Losses have been estimated as high as $12 million. Because other control methods have been unable to limit defoliation successfully and the virus which occurs naturally and limits the population of moths has not had its anticipated effect, a petition for emergency use of DDT will be presented to the EPA. Percentage of virus carried in egg masses will be examined in the spring to determine if a control program with DDT is necessary. It is hoped that this will be the last need for DDT since scientists are working on developing the natural virus for control purposes.

74-0518. Davis, G. M. (Dept. Malacol., Nat. Acad. Sci., Washington, DC). **Defoliation in Vietnam: assessing the damage.** *Frontiers 38(2): 18-23; 1973.*

As part of a National Academy of Sciences program to assess the effects of defoliants on the plant and animal life of Vietnam, mollusks, which are extremely diverse and sensitive to environmental change, were surveyed in the Rung Sat Special Zone where defoliation by agents Orange and White had turned mangrove forests into barren mud flats. Unexpectedly, more than 40 species of living mollusks were found between this area and the control Vung Tau, and 50% of the species were found in both areas. Fields of grass, new mangrove growth, and old trees provided habitat for large numbers of snails. No abnormalities were found in the snails and no molluscan species could be considered endangered. Shellfish, which depend on the nutrients from the mangrove areas, were being produced at a normal rate. It is expected that full recovery of the mangroves will occur within 10 years, based on evidence of reseeding.

74-0519. Norseth, T. (Inst. Occup. Health, Oslo 3, Norway). **Health and pollution. Some examples from the present situation.** *Med. J. Aust. Suppl. 2(4): 70-72; 1972.* (8 references)

The hazards of pollution are only partially understood in industrialized nations today, but there is suffi-

cient indication that a multidisciplinary effort must be initiated to study the problems and reduce the hazards. DDT provides an example of a widely distributed pollutant which has affected wildlife and may present a predictable hazard to man. Bird kills resulting from DDT have not necessarily been due to direct lethal doses, but to stimulation of enzymes which control estrogen levels and thus reproductive success. Enzyme inhibition also results from exposure to lead and mercury which have been distributed in the environment through nature and man.

74-0520. Thurm, V. (Hygiene-Institut Wernigerode des Bezirkes Magdeburg, Wernigerode, Germany). **Zu Notwendigkeit und Moeglichkeiten der toxikologisch-chemischen Ueberwachung fremdstoffkontaminierter Lebensmittel. 1. Mitt. Vorschlag eines Ueberwachungssystems. [On the necessity and the possibilities of the toxicological-chemical control of contaminated foods. Part I. Proposal of a control system.]** *Nahrung 17(2): 133-138; 1973.* (4 references) (German)

A system for controlling pesticide-treated foods is proposed. The system, which has special emphasis on fruits and vegetables, has already been found effective in practice. The most remarkable feature of this system is the possibility of taking prophylactic measures at the producer level. This would protect the consumer with analytical results obtained prior to the marketing of the treated products. At least 10 days before pesticide treated foods are harvested or marketed, the producer has to submit a form specifying product, dates of pesticide treatment, the active agent and the expenditure of the pesticide formulation; samples must also be submitted to a competent hygiene institute. Marketing will be permitted depending on analytical results.

74-0521. Grimme, L. H. (Botanisches Inst., Univ. Erlangen-Nuernberg, Germany). **Sind Herbizide harmlose Biozide? [Are herbicides harmless biocides?]** *Pharm. Unserer Zeit 2(2): 51-55; 1973.* (5 references) (German)

The use and harmfulness of herbicides such as phenoxyacetic acid derivatives, substituted urea compounds, *s*-triazines, substituted phenols, carbamates and thiocarbamates, chlorinated aliphatic acids, toluidines, and picloram are much debated. Many homologized herbicides do not endanger humans and animals when used in the manner and at the expenditure specified, but these are not harmless. The acute toxicities of substituted phenols, growth hormones, carbamates, *s*-triazines, substituted urea derivatives, amitrole, TCA, and borax, as determined in rats, are 30, 400, 400, 3,000, 2,000, 1,100, 3,200, and 2,000 mg/kg. Although substituted phenols persist in the soil for less than one month, growth hormones, carbamates, *s*-triazines, substituted urea compounds, amitrole, and TCA persist for 1, 6-12, over 12, 1, and 6-12 months and may be present in harvested crops. Foods are currently analyzed for residues of major classes of pesticides, such as organochlorine and organophosphorus compounds, but not for herbicide residues. This, and the impossibility of analyzing foods and crops for every possible pesticide residue and metabolite, make acceptable daily intake values relatively irrelevant.

74-0522. Lhoste, J. (Author address not given). **Des insecticides peu toxiques. [Low-toxicity insecticides.]** *Recherche 4(36): 694-696; 1973.* (French)

The synthesis, uses, and effects of pyrethrins and pyrethroids on humans and animals have been studied extensively. Pyrethroids are practically non-toxic or of low toxicity to mammals, probably due to rapid hydrolysis by the hepatic esterases. Fish, on the other hand, are highly sensitive to pyrethrins and pyrethroids. Photodegradation of pyrethrins and pyrethrinoids was rapid.

74-0523. Markkula, M. (Agr. Res. Cent., Dept. of Pest Invest., Tikkurila, Finland). **Regulation of pesticides in Finland.** *Residue Rev. 48: 117-139; 1973.* (7 references)

In 1969 the Pesticide Act in Finland was extended to apply to chemicals used in the protection of forests, for the destruction of aquatic weeds, as insect repellents, and as plant growth regulators. The Act also contains provisions on the protection of nature. The Plant Protection Institute is the key authority in the implementation of the Pesticide Act. It is composed of the Departments of Plant Husbandry, Plant Pathology, Horticulture, and Pest Investigation of the Agricultural Research Centre. These groups evaluate data on the efficiency of a new product, the chemical composition and residues, and harmful effects to cultivated plants, soil, and nature. On the basis of the risks to human health the Ministry of Social Affairs and Health will decide whether the product should be declared a toxic or a mildly toxic pesticide. Only after a favorable decision by the Ministry of Social Affairs and Health can the Plant Protection Institute grant a sales license for pesticides included in the poisons legislation. The Plant Protection Institute may grant a license for the sale of other pesticides without any decision by the Ministry of Social Affairs and Health. A sales license is issued for five years and may be renewed or cancelled. The amount of pesticides used in Finland and safety intervals for pesticides and their tolerances in foodstuffs are listed. (Author abstract by permission, abridged)

74-0524. Robinson, J. (Chem. Toxicol. Dept., Tunstall Lab., Shell Res. Ltd., Sittingbourne, Kent, England). **Industrial and agricultural pollution and the environment.** *Roy. Soc. Health J. 93(2): 62-68,106; 1973.*

Whether or not contaminants like pesticides released locally into the environment reach polluting levels depends on the rate of transfer to and away from

the particular area and on the rate of degradation of the chemical. Evaluation of the dynamics of such contaminants is complicated, as illustrated by the data on inorganic lead and organic chlorinated compounds. Lead arsenate pesticides contributed mainly to the contamination of food, particularly apples and pears; fortunately these chemicals have largely been replaced by synthetic pesticides. Mean blood levels of lead in the general U.S. population have not changed between 1925 and 1965, a reassuring conclusion but tentative, since analytical methods were not standardized during that period. Organochlorines like DDT and dieldrin have been found in small amounts almost everywhere. The impact of these compounds, however, is still questionable since no effects on the general population or on workers exposed to them have been demonstrated. Biological accumulation of these chemicals occurs, but is not arithmetic. Concentration in the food chain may not be responsible for the decline in reproductive success of several raptorial bird species.

74-0525. Ten Horn, L. J. (Municipal Slaughterhouse, Arnhem, The Netherlands). **Meat hygiene and the E.E.C.** *Roy. Soc. Health J. 93(5): 241-245; 1973.* (19 references)

Chemical residues in meat are now receiving increased attention in The Netherlands, especially since the U.S. has adopted new regulations on the quality of imported meat. Dutch canned hams contained hexachlorobenzene in 1971; the percentage of hexachlorobenzene per slaughtered pig increased in 1972. Large quantities of pollard-pellets containing hexachlorobenzene-treated seed wheat from Argentina were responsible for residues in pigs, which concentrate the pesticide by a factor of 10. Limits of 0.01 ppm in pig feed and 0.2 ppm in animal and vegetable oils and fats used in pig feed were set by the Dutch government. High residues were recently found in pigs as a result of importation of spinach seed treated with hexachlorobenzene.

74-0526. Hoeffken, F. (Bundesgesundheitsamt, Berlin, Germany). **Einfuehrung zum 2. Fachgespraech "Gewaesser und Pflanzenschutzmittel" vom 14. bis 16.6. 1972 in Berlin-Dahlem. [Introduction to the 2nd expert conference on "Water and Pesticides", Berlin-Dahlem, June 14-16, 1972.]** *Schriftenr. Ver. Wasser- Boden-Lufthyg. Berlin-Dahlem 37: 5-7; 1972.* (German)

The inaugural address of the 2nd expert conference on "Water and Pesticides" held in Berlin-Dahlem from June 14 to 16, 1972, is presented. The conference included eminent persons from West Germany, Finland, Canada, the Netherlands, Austria, and Switzerland. Pesticide homologation, analysis, and behavior in and on water, soil, and fauna were discussed. The ties between pesticide production and application and scientific research, essential to environmental protection, were also considered.

74-0527. Drescher, N. (Landwirtschaftliche Versuchsstation, Badische Anilin- und Soda-Fabrik AG, Limburgerhof, Germany). **Der Unbedenklichkeitsnachweis, derzeitiger Stand und weitere Forschungsprobleme. [Proof of harmlessness, current status and further problems for study.]** *Schriftenr. Ver. Wasser- Boden-Lufthyg. Berlin-Dahlem 37: 9-15; 1972.* (German)

Approaches and methods available to prove pesticides harmless from a complex environmental point of view are reviewed. In addition to acute and chronic toxicity studies, the degradability, metabolism in aquatic and terrestrial environments and organisms, and the leachout in soil must be thoroughly studied. The leachout properties, i.e., the potential danger of pesticides in groundwater and drinking water, are now studied by the column method, using light sandy soil, humus-rich sand, and sandy loam for the percolation of technical grade pesticides. When pesticides are absent in the percolating water, the safety of groundwater is concluded. The metabolism of leached-out pesticides is also studied, especially light stability, hydrolysis, and the influence of pH on the degradation of the pesticides. The pesticide cycle is often investigated in micro-ecosystems, such as developed by Metcalf, where the degradation and accumulation within the trophic chain of radioactive isotope-labeled pesticides can be determined. The degradability of pesticides can also be studied in artificial ponds in laboratory experiments and by means of diluted activated sludge.

74-0528. Bosshardt, H. P. (Author address not given). **Pflanzenschutz und Umwelt. [Plant protection and the environment.]** *Schweiz. Z. Forstwes. 123(10): 650-666; 1972.* (German)

General environmental hazards involved in the expanded use of plant protection agents in agriculture, horticulture, and forestry are discussed. Persistent, accumulating pesticides like DDT create many of the environmental problems. The allowable daily intake for humans is determined by dividing no-effect levels, determined over two years in rats and dogs, usually by 100. If the allowable daily intake is not to be exceeded, the regulation intervals between pesticide application and harvesting should be observed. To correct existing hazards BHC use on winter wheat has been prohibited in Switzerland because of high persistence. Also, the quantity of tetrachlorodibenzo-*p*-dioxin in the herbicide 2,4,5-T has been limited to 0.05 ppm to prevent this highly toxic, teratogenic substance from accumulating in the environment. Plant protection preparations based on DDT, aldrin, and dieldrin have been prohibited since Sept. 1, 1972.

74-0529. O'Brien, R. D. (Div. Biol. Sci., Cornell Univ., Ithaca, NY 14850). **Pesticide regulation.** *Science 182(4109): 222,224; 1973.*

Findings of a committee of scientists appointed by William Ruckelshaus to study the hazards associated

with the use of aldrin and dieldrin were ignored in the report "Pesticides: Environmentalists seek new victory in a frustrating war." A Letter-to-the-Editor reports that this committee unanimously decided that some non-polluting uses of aldrin and dieldrin should be continued, and that there was no evidence to suggest that these compounds presented a carcinogenic hazard. In one study, a strain of mice which was very susceptible to tumors did develop malignancies during treatment with aldrin and dieldrin, but other mice, dogs, rats, or primates tested did not give positive results.

74-0530. Lu, F. C. (Food Additives, World Health Organization, Geneva, Switzerland). **Wholesomeness of foodstuffs: the role of WHO.** *WHO Chronicle 27: 245-253; 1973.* (20 references)

WHO, in collaboration with FAO, has initiated a number of programs to deal with chemical contamination of foods; an Expert Committee on Pesticides was formed in 1966. About 100 pesticides have been studied so far, and methods of residue analysis and ADIs (acceptable daily intakes) and tolerances have been established where possible. Tolerances cannot be set up until an ADI has been established. When the ADI is temporary or when potential intake is higher than the ADI, only conditional tolerance values are used. Research on the effects of residues, additives, and contaminants in food were given primary importance in a resolution of the World Health Assembly, 1972.

74-0531. World Health Organization (Geneva, Switzerland). **The use of viruses for the control of insect pests and disease vectors.** *WHO Tech. Rep. Ser. 531: 3-48; 1973.* (25 references)

Of insect viruses the nuclear polyhedrosis and granulosis viruses seem to have the greatest potential for control of arthropod pests. These viruses have the best probable efficacy and safety, storage properties, relative ease of production, and range of distribution among insects. Virus control will probably be most effective when employed with other measures in an integrated project. Research is needed in the areas of assay methods and physical, chemical, and biological properties of the viruses. Many difficulties associated with toxicity testing will be avoided if it can be shown that the virus cannot multiply in cells at the body temperature of man or in cells of other species. Accumulation of virus particles in the soil does not seem to present a problem. Recommendations have been made to further national and international cooperation in continuing the development of insect viruses as control agents.

74-0532. Fog, M.; Kraul, I.* (Dept. Pharmacol. Toxicol., Royal Vet. Agr. Univ., Copenhagen V, Denmark). **Levels of polychlorinated biphenyls (PCB) and organochlorine insecticides in eggs from eider (*Somateria mollissima*).** *Acta Vet. Scand. 14(2): 350-352; 1973.* (5 references)

Mean levels of dieldrin, DDE, and polychlorinated biphenyls, the only organochlorines observed, decreased from 1970 to 1972 in eider eggs collected from a protected island in Denmark. Initial levels of 0.39, 2.12, and 35.0 ppm of dieldrin, DDE, and PCB in the fat decreased to 0.24, 1.37, and 14.0 ppm, respectively. No significant differences were observed over the study period in the thickness of the shells, indicating that even the high levels were too small to affect eggshell thickness. Organochlorine levels and shell thickness were similar to those observed in eiders from the Wadden Sea in Holland in 1970. In both cases, the populations seem to be recovering after an organochlorine intoxication related decline in 1964-1968.

74-0533. Synek, M.; Tibenska, M.; Veresikova, M. (Reg. Hyg. Sta., Bratislava, Czechoslovakia). **Znehodnotenie podzemnych vod dikotexom (Na-sol'ou kyseliny 2-metyl-4-chlorfenoxyoctovej). [Contamination of soil by dicotex (sodium salt of 2-methyl-4-chlorophenoxyacetic acid).]** *Bratislav. Lek. Listy 59(2): 203-207; 1973.* (8 references) (Slovak)

Accidental contamination of soil and groundwater at the Kopcany Cooperative Yard, Senica district, with dicotex (sodium salt of MCPA) resulted in contamination of domestic wells in the surrounding area. Well water samples from two dwellings taken in January 1970 (9 months after the spill) contained 6.4 and 4.8 ppm MCPA. Samples taken in March 1970 contained 0-0.6 ppm MCPA, and no MCPA was detected in subsequent analyses. Even after 11 months, elevated phenol, oxidizing agent, and chloride levels were detected in the well water. However, the significance of these findings is unknown since the territory is in an oil-bearing region. The odor of the spilled chemical in the contaminated area persisted for 29 months.

74-0534. Biros, F. J.; Enos, H. F. (U.S. Environ. Protection Agency, Primate & Pesticides Effects Lab., Perrine, FL). **Oxychlordane residues in human adipose tissue.** *Bull. Environ. Contam. Toxicol. 10(5): 257-260; 1973.* (8 references)

Oxychlordane residues were found in 77.8% of the 27 human adipose tissue samples taken through the National Human Monitoring Program and representative of specimens routinely analyzed for organochlorine pesticides. The levels ranged from 0.03 to 0.40 ppm and averaged 0.14 ppm. GC analysis using two different columns and TLC were used to determine oxychlordane residues after clean-up on Florisil columns. Confirmation of the material was made by obtaining mass spectra of GC eluates.

74-0535. Mingelgrin, U.; Yaron, B. (Agr. Res. Organization, Inst. Soils Water, Bet Dagan, Israel). **Conversion of some organo-phosphorus insecticides on adsorbing surfaces as affected by formulation.** *Bull. Environ. Contam. Toxicol. 10(5): 285-290; 1973.* (4 references)

Investigation of a random selection of formulations of pirimiphos-ethyl, pirimiphos-methyl, and menazon (saphizon D.P.) indicated that formulants can affect the persistence and phase distribution of pesticides. Pure pesticides and formulations were shaken for 0.5, 2, 5, 24 and 72 hr with Ca-bentonite, Ca-kaolinite, or Ca-peat. UV and GC analyses of supernatants or extracts of precipitates were used to follow disappearance of the pesticide and formation of degradation products. Pirimiphos-ethyl was highly adsorbed on Ca-kaolinite, but adsorption of all pesticides was only slightly influenced by the formulants. The relative recovery rates of pirimiphos-ethyl, pirimiphos-methyl, and their formulants, however, differed markedly in the presence of the formulants. The appearance of degradation products of pirimiphos-ethyl and methyl was reduced in the presence of formulation chemicals. No menazon degradation products were observed in the case of the pure pesticide or the formulation during the 72 hours of exposure.

74-0536. Tanji, K. K.; Mehran, M.; Biggar, J. W.; Henderson, D. W. (Univ. California, Davis, CA). **Dye tracers aid rice chemical residue studies.** *Calif. Agr. 27(7): 10-13; 1973.*

Rhodamine B, an indicator dye, behaved in the same way as Ordram 6E, a liquid form of molinate, when it was sprayed on the water surface of a flow-through test system for rice prior to seeding. Similar movement and persistence data were obtained for Rhodamine WT sprayed on the water surface in a static or stagnant water management system. The dye persisted longer in a static system and in a recycled system than in the flow-through system since no spill of flood waters occurred. Wind effects were observed, but these were eliminated when a canopy of rice was present.

74-0537. Keil, J. E.; Finklea, J. F.; Sandifer, S. H.; Miller, M. C. (Med. Univ. S. Carolina, Columbia, SC). **Pesticide exposure index (PEI).** *IN: Determination of Air Quality. G. Mamantov and W. D. Shults, eds., Plenum Press, New York-London, 1972, pp. 57-63.* (7 references)

Personal interviewing was assessed as a method of investigating pesticide exposure in a study group from coastal South Carolina. A group of 78 occupationally exposed and 63 control subjects was used. An index was calculated based on occupation, chemical form, and days of exposure during the 30 days prior to interviewing and blood sampling, taken three times during the year. The blood level of DDT and its metabolites, chosen because of its well established method of determination, corre-

lated well with the index thus derived. Correlation coefficients were .43 for DDT, .37 for DDD (TDE), and .29 for DDE. (Presented at The American Chemical Society Symposium on Determination of Air Quality, held in Los Angeles, California, April 1-2, 1971.)

74-0538. Hellmann, H. (Author address not given). **Pestizide in Gewaessern—ein Ueberblick an Hand ausgewaehlter Literatur. [Pesticides in waters: a survey based on selected literature.]** *Deut. Gewaesserk. Mitt. 17(2): 47-52; 1973.* (21 references) (German)

The general problems of and basic trends in research on the effects of pesticides in water and pesticide concentration measurements in rivers in Germany are reviewed. Although reports on pesticides in general are numerous, reports referring to the effects of pesticides on water are rather scarce. Pesticide concentration measurements in central European waters were initiated as late as 1969, after a fish kill in the Rhine. BHC, lindane, *p,p'*-DDT, dieldrin, and endosulfan concentrations measured in the Rhine between Sept. 1969 and Feb. 1971 ranged from 0.01-0.52, 0.01-0.34, 0.01-0.17, 0.01-0.08, and 0.01-0.88 μg/l. Pesticide analyses in several watercourses in Germany revealed alpha-BHC, lindane, heptachlor, aldrin, heptachlor epoxide, endosulfan, dieldrin, *p,p'*-DDE, *p,p'*-DDD(TDE), *p,p'*-DDT, and parathion concentrations of 0.502, 0.220, 0.092, 0.232, 0.033, 1.800, 0.105, 0.050, 0.282, 0.126, and 0.032 μg/l.

74-0539. Langer H. G.; Brady, T. P.; Briggs, P. R. (Eastern Res. Lab., Dow Chem. U.S.A., Wayland, MA 01778). **Formation of dibenzodioxins and other condensation products from chlorinated phenols and derivatives.** *Environ. Health Perspect. 5: 3-7; 1973.* (7 references)

Reaction conditions most likely to produce dioxins from chlorophenates were investigated. The results indicated that removal of two chlorines occurs in the solid state, at high temperatures, and that the *meta* chlorine plays an important part in the reaction. A high yield of dioxin (80%) was obtained from sodium pentachlorophenate, but not from the dichlorophenates, the trichlorophenates, or the tetrachlorophenates. Dioxins were not detected when 2,4-D, 2,4,5-T, or silvex were heated under various conditions. A total of 0.13% tetrachlorodioxin was obtained when drastic conditions were used to cleave the 2,4,5-T molecule before subjecting it to hydrolysis. It is unlikely that these herbicides would be converted to dioxins in the field.

74-0540. Jensen, S.; Renberg, L. (Special Anal. Lab., Swedish Nat. Environ. Protection Board, Stockholm 50, Sweden). **Chlorinated dimers present in several technical chlorophenols used as fungicides.** *Environ. Health Perspect. 5: 37-39; 1973.* (3 references)

Chlorinated dioxins and predioxins have been found in relatively large amounts in technical chlorophenols and in soil and other media in contact with these fungicides. The highest values obtained in some pentachlorophenol formulations were 3300 ppm octachlorodioxin, 1600 ppm predioxin, and 1600 ppm isopredioxin. Up to 50 g/kg of predioxins and isopredioxins, but no dioxins were found in 2,4,6-tri- and 2,3,4,6-tetrachlorophenols obtained by direct chlorination. Approximately 2% of pentachlorophenol impregnated on sawdust was converted to heptachlorodibenzo-*p*-dioxin and the octachloro homolog when the sawdust was burned. Octachloro- and two heptachlorodibenzofurans and a predioxin containing seven chlorines were identified in sludge taken from a dipping tank containing pentachlorophenate used for wood preservation. From 1 to 10 ppm chlorinated dioxins and predioxins were found in surface soil from different saw mills. Boat bottom paint contains about 1000 ppm chlorinated predioxins, and plankton sampled in the wake of boats treated with this paint contained about 80 ppm on a fat weight basis.

74-0541. Plimmer, J. R. (Agr. Environ. Qual. Inst., Agr. Res. Serv., USDA, Beltsville, MD 20705). **Technical pentachlorophenol: origin and analysis of base-insoluble contaminants.** *Environ. Health Perspect. 5: 41-48; 1973.* (27 references)

Pentachlorophenol, widely used in industry as a precursor for pesticides and other products and in wood preservation, is the most probable source of contamination of the environment with chlorinated dioxins. Tetrachlorodibenzofuran, octa- and nonachlorodiphenyl ethers, hexa-, hepta-, and octachlorodibenzo-*p*-dioxins have been identified in pentachlorophenol samples. Mass spectrometry can be used to characterize chlorinated dioxins and dibenzofurans. Some dioxins and their precursors have been found as photolysis products of pentachlorophenol. Elevated temperatures could also break down pentachlorophenol to produce these compounds.

74-0542. Bowes, G. W.; Simoneit, B. R.; Burlingame, A. L.; De Lappe, B. W.; Risebrough, R.,W. (Toxic Chem. Sect., Canadian Wildlife Serv., Ottawa, Ontario K1A OH3, Canada). **The search for chlorinated dibenzofurans and chlorinated dibenzodioxins in wildlife populations showing elevated levels of embryonic death.** *Environ. Health Perspect. 5: 191-198; 1973.* (21 references)

Liver and blubber from sea lions that had just given birth to premature pups on San Miguel Island, California, and herring gull eggs from Scotch Bonnet Island in Lake Ontario, where very few eggs have hatched, were analyzed for chlorinated dibenzofurans and dibenzodioxins. Samples were extracted in hexane-acetone azeotrope using a Soxhlet apparatus, cleaned up on Florisil and alumina columns, and analyzed by GC and MS. Chlorinated dibenzofuran or dibenzodioxin

compounds were not detected in the samples, but high hydrocarbon content of sea lion liver samples could have interfered with the analysis. Blubber contained 512 ppm DDE and 62 ppm polychlorinated biphenyls (PCB) on a wet weight basis, and liver contained 12 ppm DDE and 3 ppm PCB. Pooled sample of herring gull eggs contained 35 ppm DDE and 300 ppm PCB.

74-0543. Crosby, D. G.; Moilanen, K. W.; Wong, A. S. (Dept. Environ. Toxicol., Univ. California, Davis, CA 95616). **Environmental generation and degradation of dibenzodioxins and dibenzofurans.** *Environ. Health Perspect. 5: 259-266; 1973.* (47 references)

Although levels of dioxin and dibenzofuran in industrial chemicals have been dramatically reduced, there is laboratory evidence that these compounds can be generated in the environment from commonly used chlorophenols and chlorinated biphenyls. When plywood chips containing 53 μg/g PCP were completely charred, the pyrolyzate contained about twice the amount of octachlorodibenzo-*p*-dioxin found in the wood, and hepta- and hexachlorodibenzo-*p*-dioxin were also detected. Irradiation of 5 pure 2-chlorinated biphenyls in aqueous suspension produced traces of 2-chlorodibenzofuran and identifiable amounts of 2,5-dichloro- and 2,5,2′,5′-tetrachlorobiphenyls. Photodecomposition of 2,7-dichloro-, 2,3,7-trichloro-, and 2,3,7,8-tetrachlorodibenzo-*p*-dioxins occurred in a few hours in sunlight or a sunlight simulator, and model chlorinated dibenzofurans were also photodecomposed in methanol or even water. Impurities in solvents drastically altered the rate of photodegradation. Degradation appears to occur more readily than generation in most of the laboratory studies, but the environmental balance has not yet been determined.

74-0544. Hutzinger, O.; Safe, S.; Wentzell, B. R.; Zitko, V. (Atlantic Reg. Lab., Nat. Res. Council Canada, Halifax, Nova Scotia, Canada). **Photochemical degradation of di- and octachlorodibenzofuran.** *Environ. Health Perspect. 5: 267-271; 1973.* (15 references)

Complete photodecomposition of 2,8-di- and octachlorodibenzofuran occurred in 6 and 20 hr, respectively, when hexane solutions of the compounds were irradiated under UV light. The rate of degradation was about 4 times as fast in methanol. Only dechlorination products were found upon analysis of irradiated solutions, and unidentified resinous polymeric products eventually accumulated. Dechlorination was also observed, but to a lesser extent, when thin films of these compounds were exposed to sunlight for prolonged periods.

74-0545. Kearney, P. C.; Woolson, E. A.; Isensee, A. R.; Helling, C. S. (Pestic. Degradation Lab., Agr. Environ. Quality Inst., A.R.S., USDA, Beltsville, MD 20705). **Tetrachlorodibenzodioxin in the environment: sources, fate, and decontamination.** *Environ. Health Perspect. 5: 273-277; 1973.* (10 references)

Based on the composition of Herbicide Orange, which contained a 50/50 mixture of 2,4,-D and 2,4,5-T and about 1.91 ppm dioxin, a considerable, but undeterminable amount of the contaminant was released into the environment during the period when 2,4,5-T production was not controlled. Since the introduction of a 0.5 ppm limit of TCDD in 2,4,5-T preparations, it can be predicted that 0.05 mg/A or 0.1 ppt in the top 3 inches of soil would be deposited during peacetime use. TCDD has a half-life in soil in the laboratory of about two years and was not photodecomposed on wet or dry soil surfaces or produced photolytically from 2,4,5-T in water. It did not move vertically in a variety of soils, nor did it accumulate in seeds or mature oat and soybean plants. Incineration is apparently one of the safest methods for complete destruction of TCDD, but additional information is needed on the process. Soil biodegradation and chlorinolysis are alternative methods of disposal.

74-0546. Wallace, R. R.; Merritt, W. F.; West, A. S. (Dept. Biol., Queen's Univ., Kingston, Ontario, Canada). **Dispersion and transport of rhodamine B dye and methoxychlor in running water: a preliminary study.** *Environ. Pollut. 5(1): 11-18; 1973.* (24 references)

Rhodamine B was a good indicator of methoxychlor movement in two streams of different flow characteristics. Peak doses of dye and insecticide from concurrent dye-insecticide treatments, delivered to the furthest point in both streams, coincided although dye was introduced in aqueous solution and insecticide in oil. The arrival times for the two peaks were approximately 50 and 80 min for similar distances in streams 1 and 2, reflecting a faster rate of flow in stream 1 and the presence of pools in stream 2. Greater dispersion was also observed in stream 2. Experiments with Rhodamine B alone indicated that the time of passage downstream increased with the distance. Peak concentrations at each sampling station decreased with distance downstream.

74-0547. Adams, R. E. (Author address not given). **Keeping milk free of pesticides.** *FDA (Food Drug Admin.) Pap. 6(3): 32-33; 1972.*

Most of the milk regulatory agencies in Texas, Oklahoma, and New Mexico have been involved for more than a year in a program initiated by the Special Programs Branch of the FDA Region VI for testing raw milk for pesticide residues. In the first year, none of the 223 samples analyzed contained pesticides above the actionable level set by the FDA. In the two instances in which residues approached this level sources of contamination were identified as alfalfa hay and cottonseed feed containing DDT and removed from use. New Mexico has since that time discontinued the use of DDT as a pesti-

cide. Shipment of feed in reused, treated grain seed bags and feeding contaminated hay or grazing on pasture recently sprayed with a pesticide have produced residues in the milk.

74-0548. Bowman, M. C.; Leuck, D. B. (Entomol. Res. Div., Agr. Res. Serv., USDA, Tifton, GA 31794). **Bay 93820 residues: their determination and persistence in Coastal bermudagrass, forage corn, and corn silage.** *Int. J. Environ. Anal. Chem. 1(1): 35-46; 1971.* (7 references)

Residues of Bay 93820 (isopropyl salicylate *O*-ester with *O*-methyl phosphoramidothioate) were determined using a modified GC technique. The insecticide was extracted into methanol-chloroform using a Soxhlet apparatus, the solvent evaporated to dryness, and the residue taken up in hexane and analyzed on a GC equipped with a flame photometric detector. Residues in forage corn and Coastal bermudagrass had declined to < 1 ppm after 14 days of weathering, even at the highest treatment (24 oz/A). Highest residues of the oxygen analog were observed just after spraying and accounted for about 1/40 of the total, a proportion greater than that found with other *O*-analog-forming organophosphates tested. Bay 93820 was essentially stable and persistent in corn silage, and the *O*-analog tended to increase.

74-0549. Silk, P. J.; Unger, I. (Chem. Dept., Univ. New Brunswick, Fredericton, New Brunswick, Canada). **The photodecomposition of 1,1-dichloro-2,2-bis(5′-chloro-2′-methoxyphenyl)ethylene (MPE), an analogue of DDE.** *Int. J. Environ. Anal. Chem. 1: 301-306; 1972.* (11 references)

The primary photodecomposition products of 1,1-dichloro-2,2-bis(5′-chloro-2′-methoxyphenyl)-ethylene (MPE) in degassed solutions were 2,5-dichloro-3-(5′-chloro-2′-methoxyphenyl)benzofuran (BFD) and CH_3Cl. An unidentified non-volatile product and traces of HCl and CH_4 were also observed. Dissolved oxygen did not affect the production of the two compounds, suggesting that a proposed cyclization reaction occurs from a singlet state. The products do not resemble those of DDE or MPA photolysis.

74-0550. Caro, J. H.; Freeman, H. P.; Glotfelty, D. E.; Turner, B. C.; Edwards, W. M. (Agr. Environ. Qual. Inst., Agr. Res. Serv., U.S. Dept. Agr., Beltsville, MD 20705). **Dissipation of soil-incorporated carbofuran in the field.** *J. Agr. Food Chem. 21(6): 1010-1015; 1973.* (11 references)

In a 2-year investigation carbofuran dissipation was measured by periodic sampling of soil, runoff, and maize (*Zea mays* L.) crops in two small watersheds to which granular carbofuran had been applied, either broadcast or in the seed furrow. Carbofuran disappeared from soil by apparent first-order kinetics, the half-life ranging from 46 to 117 days. About 5 to 10% converted to 3-ketocarbofuran, which disappeared at about the same rate as the parent. Carbofuran persistence was increased with in-furrow application, more acid soil, and low soil temperature. Pesticide degradation was greatly accelerated in small areas of the watersheds, characterized by high soil water contents, high pH, or heavy soil texture. From 0.5 to 2.0% of the carbofuran applied was lost in runoff, mostly in water rather than in sediments. Less pesticide was lost in a given volume of runoff from an in-furrow application than from a broadcast application. The maize accumulated 0.14% of the applied pesticide by late summer, mostly in the leaves, but residues had decreased sharply by harvest. Most of the pesticide in the leaves had metabolized to 3-hydroxycarbofuran. Carbamate levels in the maize were below established tolerances. (Author abstract reprinted by permission of the American Chemical Society)

74-0551. Sirons, G. J.; Frank, R.; Sawyer, T. (Provincial Pestic. Res. Lab., Ontario Ministry Agr. Food, Guelph, Ontario). **Residues of atrazine, cyanazine, and their phytotoxic metabolites in a clay loam soil.** *J. Agr. Food Chem. 21(6): 1016-1020; 1973.* (11 references)

The degradation of atrazine and cyanazine was investigated in a Perth clay loam soil. Atrazine and cyanazine were applied at rates of 1, 2, and 3 lb/A of active ingredients as pre- and postemergence treatments. Soil was sampled from plots after 0, 2, 3.5, 5, and 12 months at 0-2.5, 2.5-5, and 5-10 in. depths. Atrazine, cyanazine, and their phytotoxic metabolites were extracted with a 65% acetonitrile-water mixture and quantitated on a Coulson conductivity detection system. Presented data indicates that atrazine is converted into deethylated atrazine as a major and deisopropylated atrazine as a minor phytotoxic metabolite and that cyanazine is changed to deisopropylated atrazine as a major phytotoxic metabolite. Cyanazine amide was found. It is proposed that the hydrolysis precedes the microbiological degradation to the deisopropylated atrazine. (Author abstract reprinted by permission of the American Chemical Society)

74-0552. Ruzo, L. O.; Zabik, M. J.; Schuetz, R. D. (Dept. Chem. Entomol., Michigan State Univ., East Lansing, MI 48823). **Photochemistry of bioactive compounds. Kinetics of selected *s*-triazines in solution.** *J. Agr. Food Chem. 21(6): 1047-1049; 1973.* (10 references)

The rate constants (k) for several 2-methylthio and 2-halo-4,6-bis(alkylamino)-*s*-triazines have been calculated in methanol, *n*-butyl alcohol, and water solutions. The rate of disappearance of the starting material (I-XII) has been found to be dependent on the nature of the halogen and alkyl substituents and the solvent employed. A decrease in k was observed in the order

I-Br-Cl-F and $-C_2H_5 > -C_3H_7$. All photoreactions showed zero-order rate constants. The rate constant in methanol was considerably greater than that calculated in *n*-butyl alcohol. (Author abstract reprinted by permission of the American Chemical Society)

74-0553. Crosby, D. G.; Wong, A. S. (Dept. Environ. Toxicol., Univ. California, Davis, CA 95616). **Photodecomposition of *p*-chlorophenoxyacetic acid.** *J. Agr. Food Chem. 21(6): 1049-1052; 1973.* (16 references)

Aqueous solutions of 4-CPA (*p*-chlorophenoxyacetic acid) decomposed readily under sunlight or laboratory ultraviolet light (300-450 nm) to provide principally *p*-chlorophenol, phenol, hydroquinone, *p*-chlorophenyl formate, phenoxyacetic acid, *p*-hydroxyphenoxyacetic acid, and humic acids. These products represent oxidative removal of the side chain, replacement of the chlorine by hydroxyl or by hydrogen, and polymerization of unstable intermediates. Formation of *p*-chlorobenzonitrile by irradiation of 4-CPA in the presence of cyanide ions substantiated that the corresponding replacement of the ring chlorine by hydroxyl was a photonucleophilic reaction. (Author abstract reprinted by permission of the American Chemical Society.)

74-0554. Crosby, D. G.; Wong, A. S. (Dept. Environ. Toxicol., Univ. California, Davis, CA 95616). **Photodecomposition of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) in water.** *J. Agr. Food Chem. 21(6): 1052-1054; 1973.* (15 references)

Photodecomposition of the herbicide 2,4,5-T in aqueous solution principally involved cleavage of the ether bond and replacement of the ring chlorines by hydroxyl and by hydrogen. The major products were 2,4,5-trichlorophenol and 2-hydroxy-4,5-dichlorophenoxyacetic acid; 4,6-dichlororesorcinol, 4-chlororesorcinol, 2,5-dichlorophenol, and a dark polymeric product also were isolated. The toxic 2,3,7,8-tetrachlorodibenzo-*p*-dioxin was not detected among the photodecomposition products. 2,4,5-T photolyzed very slowly compared to its 4-chloro and 2,4-dichloro analogs, but the 11-fold increase in photolysis rate caused by sensitization with acetone or riboflavin suggests that sunlight can be an important factor in the environmental degradation of 2,4,5-T. (Author abstract reprinted by permission of the American Chemical Society)

74-0555. Baude, F. J.; Gardiner, J. A.; Han, J. C. Y. (E. I. du Pont de Nemours Co. Inc., Biochem. Dept., Exp. Sta., Wilmington, DE 19898). **Characterization of residues on plants following foliar spray applications of benomyl.** *J. Agr. Food Chem. 21(6): 1084-1090; 1973.* (16 references)

This paper reports the results of special tests using radiolabeled benomyl and MBC. These tests confirm by chemical means that the systemic fungicide benomyl has adequate stability in typical aqueous suspensions used for foliar applications. After application to plant foliage, benomyl constitutes a major component of the total residue for extended periods. Other than MBC, which also has fungicidal properties, no residues of possible conversion products of benomyl, particularly those which can form under alkaline conditions, were found in these tests. Thus, intact benomyl is available on treated plant surfaces for systemic fungus disease control. This finding supplements work reported elsewhere which has shown that more biologically active compound enters and moves within herbaceous plants when benomyl, rather than MBC, is applied to leaf surfaces. (Author abstract reprinted by permission of the American Chemical Society)

74-0556. Ivie, G. W. (Vet. Toxicol. Entomol. Res. Lab., Agr. Res. Serv., College Station, TX 77840). **Nature and toxicity of two oxychlordane photoisomers.** *J. Agr. Food Chem. 21(6): 1113-1115; 1973.* (18 references)

Oxychlordane is converted to two major photoproducts when exposed to sunlight as deposits on silica gel chromatoplates. These derivatives are methylene-bridged isomers, one containing a keto group generated by photochemical cleavage of the oxychlordane oxirane ring and the other with an intact epoxide moiety. Their formation is greatly accelerated by xanthone photosensitizer. Oxychlordane and its keto photoisomer are quite toxic to white mice, but the second isomer is of very low toxicity. (Author abstract reprinted by permission of the American Chemical Society)

74-0557. Huang, J. C.; Liao, C. S. (Dept. Civ. Eng., Univ. Missouri, Rolla, MO). **Adsorption of pesticides by clay minerals.** *J. Amer. Soc. Civ. Eng. 96(SA5): 1057-1076; 1970.* (12 references)

DDT, dieldrin, and heptachlor were adsorbed readily on clay minerals, a major portion of the equilibrium amount on expansible clays being adsorbed within several minutes. Equilibrium was reached within one hour in the case of DDT while a definite desorption of dieldrin began to take place after several minutes. DDT and heptachlor were adsorbed more gradually on an expansible clay, and two distinct stages—deposition on the surface and gradual diffusion into the interlamellar spaces—were observed. DDT and heptachlor are primarily adsorbed through hydrogen bonding; dieldrin adsorption can be attributed mostly to strong interaction between the dieldrin epoxide ring and the oxygen on the clay minerals. Adsorptive capacities of the clay minerals used did not correlate with their ion exchange capacities or specific surface areas. The results have demonstrated that clays may be useful as carriers or diluents of pesticides in agricultural applications. Studies on the efficacy and on prevention of runoff would have to be carried out to determine their usefulness.

74-0558. Rowe, D. R.; Canter, L. W.; Mason, J. W. (Ogden College Sci. Technol., W. Kentucky Univ., Bowling Green, KY). **Contamination of oysters by pesticides.** *J. Amer. Soc. Civ. Eng. 96(SA5): 1221-1234; 1970.* (16 references)

Low levels of dieldrin and endrin were found in *Crassostrea virginica* oysters, water, and bottom sediment samples collected during 1968-1969 in a southeastern Louisiana oyster-growing estuarine area. Dieldrin was found in determinable concentrations in 93 of 113 oyster samples; the maximum observed was 3.4 ppb. Endrin was identified in only 3 of 111 samples, and the maximum level was 2.4 ppb. Maximum concentrations of dieldrin and endrin in water samples were 4 and 5 ppb, respectively. The mean levels observed were lower by a factor of 7 to 10 than those reported for the same general area previously, reflecting a decline in use of these pesticides in the watershed. Oysters contained greater concentrations of dieldrin following heavy rains, suggesting that the contamination was from land drainage. In laboratory studies on bottom sediment sorption of the pesticides was time- and pH-dependent. Salinity affected endrin sorption but not dieldrin sorption.

74-0559. Oloffs, P. C.; Albright, L. J.; Szeto, S. Y.; Lau, J. (Dept. of Biol. Sci., Simon Fraser Univ., Burnaby 2, British Columbia, Canada). **Factors affecting the behavior of five chlorinated hydrocarbons in two natural waters and their sediments.** *J. Fish. Res. Bd. Can. 30(11): 1619-1623; 1973.* (5 references)

Water samples from the Fraser River and Georgia Strait, British Columbia, were treated with different chlorinated hydrocarbons and incubated for up to 12 weeks at 13 C. In the presence of bottom sediments from the same locations as the waters, no residues escaped into the atmosphere. With the exception of lindane in ocean water, all detectable residues had moved into the sediments after 6 weeks. Most of the lindane was metabolized. Sterilization of the waters and sediments prevented the metabolism of lindane but had little effect on DDT and DDD(TDE). Agitation of water samples containing γ-chlordane, incubated without sediment, had no effect on its disappearance, but the presence of 0.01% of a nonionic surfactant retarded this almost completely. (Author abstract by permission)

74-0560. Addison, R. F.; Brodie, P. F. (Fish. Res. Bd. Can., Bedford Inst. Oceanogr., Dartmouth, N.S., Canada). **Occurrence of DDT residues in beluga whales (*Delphinapterus leucas*) from the Mackenzie Delta, N.W.T.** *J. Fish. Res. Bd. Can. 30(11): 1733-1736; 1973.* (16 references)

Tissues of Beluga whales (*Delphinapterus leucas*) sampled from a transient herd off the Mackenzie Delta, N.W.T., contained residues of the DDT pesticide group. Muscle and liver contained *p,p'*-DDE and *p,p'*-DDT; total residue concentrations in these tissues were approximately 0.01 and 0.02 ppm fresh weight, respectively. Blubber contained *p,p'*-DDE, *p,p'*-DDT, and *o,p'*-DDT; total residue content was approximately 2–4 ppm fresh weight. (Author abstract by permission)

74-0561. Thurm, V.; Thorand, B. (Hygiene-Institut Wernigerode des Bezirkes Magdeburg, Wernigerode, Germany). **Aussagen ueber das Vorkommen von insektiziden Chlorkohlenwasserstoffen in der Schulspeisung der DDR. [Statements concerning the occurrence of organochlorine pesticides in school meals in the GDR.]** *Nahrung 17(2): 125-131; 1973.* (9 references) (German)

Meals served in school cafeterias in two locations in East Germany were analyzed by TLC for aldrin, DDT, DDD (TDE), DDE, dieldrin, endrin, heptachlor, lindane, methoxychlor, and Thiodan (endosulfan) residues in 1970 and 1971. Organochlorine pesticide residues between 0.05 and 0.1 ppm were detected in 29% of all samples investigated. Residue levels exceeding the maximum allowable concentrations were not found, only residues of DDT, DDE, DDD, BHC, and PCBs were determined. While the residues were fairly uniformly distributed among all kinds of meals, meals with eggs had unusually high residue levels. The residue levels were highest in samples from February; 56% were contaminated. Samples taken in May and September had a contamination percentage of only 20-21%; the percentages of contaminated meals were 19% and 37%.

74-0562. Knoll, W.; Jayaraman, S. (Hygiene-Institut, Ernst-Moritz-Arndt-Univ., Greifswald, Germany). **Zur Kontamination von Humanmilch mit chlorierten Kohlenwasserstoffen. [On the contamination of human milk with chlorinated hydrocarbons.]** *Nahrung 17(5): 599-615; 1973.* (52 references) (German)

One hundred sixty-four milk samples from 96 lactating mothers living in the Greifswald area were analyzed for organochlorine pesticide residues by thin-layer chromatography. The lower limits of detection were 0.005 ppm *o,p'*-DDT, 0.01 ppm *p,p'*-DDT, or *p,p'*-DDD (TDE); 0.01-0.05 ppm *p,p'*-DDE, γ-BHC or β-BHC; and 0.1 ppm PCB. The number of women whose milk contained *p,p'*-DDT, *p,p'*-DDE, PCB, β-BHC, traces of *p,p'*-DDD and of *o,p'*-DDT was 96, 95, 65, 64, 12, and 3, respectively. The average *p,p'*-DDT, *p,p'*-DDE, β-BHC, and PCB levels in human milk samples investigated were 0.09 ppm, 0.21 ppm, 0.07 ppm, and 0.09 ppm. Cows' milk samples collected in the same area contained 0.0038 ppm total DDT, indicative of accumulation and mobilization of DDT residues in the women during lactation. The total DDT content in the human milk samples increased over 15 days and then remained nearly constant for the rest of the lactation period. The total DDT contents in milk samples from women with only one child were 0.38 ppm-0.05 ppm higher than those in milk samples from women with more than one. Residue levels were higher in milk samples from underweight and normal-weight women than in overweight ones.

74-0563. Fisher, H. I. (School Med. Dept. Zool., Southern Illinois Univ., Carbondale, IL 62901). **Pollutants in North Pacific albatrosses.** *Pacific Sci. 27(3): 220-225; 1973.* (30 references)

Organochlorine pesticide levels in visceral fat samples collected from birds in the North Pacific in 1969 were higher in black-footed albatrosses which follow ships and swallow discarded material than in Laysan albatrosses. After hydrolysis of the samples, mean residues were 0.25 ppm TDE, 1.47 ppm DDT, 15.3 ppm polychlorinated biphenyls, 15.3 ppm DDE, and no detectable residues of dieldrin. However, these values may not be accurate because of the interference of PCBs in the assay. Mercury levels in the visceral fat were 0.75 ppm in the black-footed albatross and 0.104 in the Laysan albatross. Total, ash, and inorganic weights of eggshells from Laysan albatrosses did not differ appreciably among values for 1913, 1959, and 1969. The total weight of eggs from black-footed albatross decreased significantly between 1959 and 1969, but not between 1912 and 1969.

74-0564. Cloos, P. (Fac. des Sci. Agron., Univ. Catholique de Louvain, Louvain, Belgium). **Interactions entre les pesticides et la fraction minerale du sol. [Interactions between pesticides and the mineral fraction of soil.]** *Pedologie 22(2): 148-173; 1972.* (63 references) (French)

The principal mechanisms involved in the adsorption of organic compounds by clay (mineral) surfaces are ion exchange, protonation, hydrogen bonding, ion-dipole interactions, coordination, pi electron bonding, and Van der Waals forces. Clay minerals apparently performed a catalytic function in the chemical degradation of certain pesticides. Certain chlorinated and methoxylated *s*-triazines underwent hydrolysis and protonation during their adsorption on montmorillonite. Diquat and paraquat were adsorbed on clay particles through ion exchange. Montmorillonite with hydrogen, alkali-metal, or alkaline-earth cations induced the protonation of *s*-triazines. Ion-dipole and coordination type interactions occurred between carbonyl oxygen and cations when isopropyl-*N*-phenylcarbamate and ethyl-*N*,*N*-di-*n*-propylthiocarbamate (EPTC) were adsorbed on montmorillonite saturated with traces of alkali metals, alkaline earths, and transition metals.

74-0565. Dekhuijzen, H. M; Bodlaender, K. B. A. (Inst. Organic Chem., T.N.O. Utrecht, The Netherlands). **Distribution and persistence of chlormequat in potato plants.** *Pestic. Sci. 4(5): 619-627; 1973.* (19 references)

The distribution and persistence of chlormequat was determined chemically in chlormequat treated potato plants and in the progeny from their tubers. Chlormequat penetrated into the leaves, was translocated to the tubers, and accumulated in the underground parts. Potato tubers harvested from chlormequat treated plants produced temporarily dwarfed plants. In the progeny of tubers the compound was translocated to all parts of the plant, the highest amounts being found in the underground parts. A loss of only 18 ± 2% occurred between planting the seed tubers and harvesting the potato plants two months later. (Author abstract by permission)

74-0566. Burns, I. G.; Hayes, M. H. B.; Stacey, M. (Nat. Vegetable Res. Sta., Wellesbourne, Warwick, England). **Studies of the adsorption of paraquat on soluble humic fractions by gel filtration and ultrafiltration techniques.** *Pestic. Sci. 4(5): 629-641; 1973.* (25 references)

The adsorption of paraquat dichloride on a soluble sodium humate fraction of a Fenland soil was studied by gel filtration (on Sephadex G10 and G100) and by ultrafiltration (through an Amicon Diaflo UM-2 ultrafilter). Both methods depend upon the separation, on a molecular weight basis, of the unadsorbed molecules of herbicide from the adsorption complex (consisting of polymeric organic materials and the adsorbed paraquat). Separations were obtained on columns of Sephadex G10 (Method I) and in the ultrafiltration experiments (Method II), and isotherms were prepared from data for adsorption in water (by Method II) and in sodium chloride (by Methods I and II) solutions. Results from the two methods were comparable over the concentration range examined. The increased adsorption of paraquat by Na^+-compared with Ca^{2+}-humate is explained on the basis of the selectivity sequence of humate for exchangeable cations. Attempts to prepare isotherms from gel fitration data, for the adsorption of paraquat on two soluble model humic polymers (polyacrylic acid and a polymer prepared by the oxidative coupling of benzoquinone and ammonium chloride), were unsuccessful because binding to the gel matrix did not permit quantitative recoveries of the adsorption complexes. Paraquat was adsorbed to the same extent on each of four fractions of Na^+-humate separated on Sephadex G100. (Author abstract by permission)

74-0567. Walker, A. (Nat. Vegetable Res. Sta., Wellesbourne, Warwick, England). **Availability of linuron to plants in different soils.** *Pestic. Sci. 4(5): 665-675; 1973.* (14 references)

Total uptake of linuron by wheat seedlings in nutrient solutions was close to that expected from the product of the amounts of water transpired by the plants and the concentrations of herbicide in solution. Uptake from 19 different soils was less than the amount supplied by mass-flow when the concentrations of linuron in the soil solution were estimated from slurry adsorption measurements. Using a pressure-membrane technique, it was shown that the actual soil solution concentrations of linuron were less than those estimated, and following rewetting of pressure-membrane samples, the rate of redistribution of linuron between the

adsorbed and solution phases was slow. The results suggest that under the conditions of the uptake experiments, the systems were not in equilibrium, and show that the rates of adsorption and desorption of linuron may be important in determining its availability to plants. (Author abstract by permission)

74-0568. Beitz, H.; Seefeld, F.; Pank, F. (Inst. fuer Pflanzenschutzforschung, Kleinmachnow, Germany). **Pflanzenschutzmittel-Rueckstaende an Arzneipflanzen – DDT- und Lindan-Rueckstaende in Pfefferminze. [Pesticide residues in medicinal plants – DDT and lindane residues in peppermint plants.]** *Pharmazie 28: 270-271; 1973.* (7 references) (German)

Lindane and DDT residues were determined in peppermint plants grown in soils previously treated with these pesticides. In different sections of the vegetation period the DDT residues determined in peppermint plants and in the soil in which they were grown ranged from 0.5-2.3 ppm and 0.04-0.53 ppm. The rate of DDT translocation from the soil into peppermint plants at harvesting time was 24.9%, remarkably high compared with that determined for wheat (9.2%), lettuce (5.2%), potato bulbs (4.5%), and carrot roots (10.7%). DDT residues in peppermint rapidly increased during the vegetation period. Lindane residues were about 0.1 ppm in soil and 0.003-0.091 ppm in peppermint plants grown there. Lindane concentrations in peppermint plants rapidly increased by harvesting time.

74-0569. Leroux, P.; Gredt, M. (Lab. de Phytopharm., C.N.R.A., Versailles, France). **Devenir de la carboxine utilisee en enrobage de semences de ble: absorption, transport et degradation. [The fate of carboxin used for wheat seed dressing: absorption, transport, and degradation.]** *Phytiat.-Phytopharm. 21(1): 45-60; 1972.* (9 references) (French)

The incorporation, distribution, transport, and degradation of carboxin in germinating wheat seeds previously dressed with this agent were studied by biological tests, using *Ustilago zea* Beck., *U. hordei* Pers., and *Rhizoctonia solani* Kuhn and by TLC and radiography. The fungistatic activity of carboxin present on the surface of germinating seeds decreased rapidly while the loss from inside the seeds did not begin until three days after sowing. About 20% of the original carboxin was found inside the germinating seeds on the first day after sowing and went up to 40% by the 14th day. Carboxin present on the outside of germinating seeds metabolized mainly into sulfoxide and other unidentified metabolites. Oxycarboxin and aniline were not detected. The half-life of carboxin was 6 to 7 days. Carboxin rapidly metabolized into sulfoxide, especially in non-sterile soil. Carboxin degradation was more rapid inside seeds than on the surface. Non-degraded carboxin was present in higher proportion in seeds than in embryos and leaves, possibly due to the more rapid degradation, and to the facilitated migration of water-soluble sulfoxide in germinating seeds.

74-0570. Van Alfen, N. K.; Kosuge, T. (Univ. California, Davis, CA). **Fate of the fungicide 2,6-dichloro-4-nitroaniline in soil.** *Phytopathology 63(2): 209; 1973.*

Labeled DCNA (dichloran) was rapidly metabolized in nonsterile, flooded soil amended with glucose. $^{14}CO_2$ was not detected during the experiment. A large fraction (up to 65%) of the radioactivity could not be extracted using an acetone-water system. The major extractable metabolite was identified as 4-amino-3,5-dichloroacetanilide, and 2,6-dichloro-*p*-phenylenediamine was also recovered. In sterile soil most of the radioactivity extracted after 9 days was intact DCNA.

74-0571. Adams, R. S., Jr. (Dept. of Soil Sci., Univ. of Minnesota, St. Paul, MN). **Factors influencing soil adsorption and bioactivity of pesticides.** *Residue Rev. 47: 1-54; 1973.*

Adsorption of pesticides by soil colloids and the bioactivity of pesticides in soils seem to be closely correlated. The shape and configuration of the pesticide molecule, pH, water solubility, and the charge distribution on pesticide molecule and adsorbent also influence a pesticide's behavior. Soil properties, such as clay content and type, organic matter content, surface area, field moisture capacity, etc., play major but unpredictable roles in determining pesticide behavior. Soil pH affects the soil colloids and consequently pesticide behavior; adsorbed cations in the soil influence pesticide adsorption through their ability to hydrolyze water and alter surface acidity. Many pesticide molecules cannot effectively compete with water for adsorption on soil colloids. Increases in soil water or temperature may cause some pesticides to transfer from mineral colloids to organic colloids. Prediction equations are of academic interest but may have little value in the field because of the inconsistency in a given soil property in describing behavior among pesticides, among soils, among crops, and the inability to precisely estimate weather or soil moisture conditions in advance of the cropping season. Caution is also needed because of the interdependency of soil properties. (Author abstract by permission, abridged)

74-0572. Beynon, K. I.; Hutson, D. H.; Wright, A. N. (Shell Res. Ltd., Sittingbourne, Kent, England). **The metabolism and degradation of vinyl phosphate insecticides.** *Residue Rev. 47: 55-142; 1973.*

The degradation of vinyl phosphate insecticides in plants, soils, water, and animals has been reviewed, and some consideration has been paid to their thermal degradation and the degradation of residues during

processing of foods. The lipophilic compounds chlorfenvinphos and tetrachlorvinphos degrade in soils, plants, and animals by breakage of the P–O–alkyl and P–O–vinyl bonds. In animals, at least, the cleavage of the P–O–C (alkyl) bond is not primarily an hydrolysis by esterase. These dealkylation reactions occur via two different mechanisms: enzymatic oxidation of the alkyl group leading to its loss as an aldehyde and transfer of methyl groups from dimethyl phosphate triesters to glutathione. The hydrophilic crotonates, mevinphos and crotoxyphos, and the crotonamides, phosphamidon, dicrotophos and monocrotophos, show additional reactions to attack of P–O–C bonds. In these compounds attack of the vinyl substituents is possible leading to carboxy acids for the crotonates and to *N*-methylols or *N*-ethylols and *N*-desalkyl derivatives for the crotonamides. These reactions are important since the products are ChE inhibitors and the reactions do not involve detoxification. However, these derivatives are detoxified by attack of P–O–C bonds. None of the members of this class is unduly persistent in crops or soils and they are readily excreted by animals either unchanged or as metabolites. (Author abstract by permission, abridged)

74-0573. Sethunathan, N. (Central Rice Inst., Cuttack-6, India). **Microbial degradation of insecticides on flooded soil and in anaerobic cultures.** *Residue Rev. 47: 143-165; 1973.*

The present knowledge of microbial degradation of insecticides in flooded soil and anaerobic cultures is reviewed. Certain organochlorine insecticides (lindane, other isomers of BHC, DDT, heptachlor, methoxychlor, endrin) are now known to be rapidly biodegradable in flooded soil; others (TDE, chlordane, dieldrin, aldrin) belonging to the same group are degraded slowly. Some microorganisms that can metabolize readily the degradable organochlorine under anaerobic conditions or through reductive reactions under aerobic conditions have been characterized. A strict anaerobe, *Clostridium* sp. from flooded soil, could degrade a variety of organochlorines possibly by reductive dechlorination. High temperature and high organic matter, which lower the redox potential in flooded soil by stimulating the microbial activity, favor organochlorine degradation. On the other hand, oxidizing compounds are inhibitory. Diazinon and parathion are rapidly destroyed in flooded soil by biological hydrolysis particularly after repeated additions. A facultative anaerobe, *Flavobacterium* sp. from flooded soil, could cleave the P–O–C linkage of diazinon and parathion. In flooded soil, biochemical transformations, reductive dechlorination (DDT), hydrolysis (diazinon and parathion), and nitro-group reduction (parathion) have been demonstrated. Dehydrochlorination (DDT), ring cleavage (2-isopropyl-4-methyl-6-hydroxypyrimidine), and epoxidation (aldrin and heptachlor) are apparently blocked in oxygen-depleted flooded soil. (Author abstract by permission)

74-0574. Kawar, N. S.; De Batista, G. C.; Gunther, F. A. (Fac. Agr. Sci., Amer. Univ. of Beirut, Beirut, Lebanon). **Pesticide stability in cold-stored plant parts, soils, and dairy products, and in cold-stored extractives solutions.** *Residue Rev. 48: 45-77; 1973.*

Although the field of pesticide residue analyses has seen tremendous advances in recent years, one aspect has been widely neglected. This is the study of the stability of pesticide chemicals on and in foodstuffs and other substrates or in extractives solutions stored under cold conditions until extraction and/or analysis. An exhaustive search of the literature has disclosed information on the storage stability of only 35 pesticides. Of these, 12 are organophosphate and five are organochlorine insecticides. Information is also available on seven acaricides, three fungicides, and six herbicides. The remaining two are miscellaneous insecticides. It is very difficult to make any generalizations regarding the stability of pesticides in cold storage since it is influenced by the temperature, by the substrate, and by the duration of storage. It is essential that the storage stability of a particular pesticide be determined whenever residue analyses are carried out. (Author abstract by permission, abridged)

74-0575. Herzel, F. (Inst. fuer Wasser-, Boden- und Lufthygiene, Berlin, Germany). **Beurteilung der Wassergefaehrdung bei Pflanzenschutzmitteln. [Evaluation of the threat to water by pesticides.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 17-20; 1972.* (German)

In a hygienic consideration, pesticides should not be regarded as insoluble in water since even the small amounts which dissolve may have negative ecological effects and seriously impair the organoleptic properties of the water. The odor threshold concentrations of heptachlor, toxaphene, and *p*-chlorophenol, a metabolite of 2,4-D and its derivatives, were 1, 5, and 2 μg/l., respectively. Many pesticides volatilize from treated plants and soil without being broken down; they may return to earth in precipitation, usually producing rainwater residues in the ng range. The chemical and biological degradability of pesticides should be chosen as a compromise between technical and ecologic requirements. The metabolism of pesticides, which often results in increased solubility and increased toxicity of the metabolites compared to the original compounds, is an essential field of study in pesticide toxicology. The effects of various methods of processing, e.g. cooking of foods and chemical or physical treatment of drinking water, on the reduction of the pesticide residue levels should be duly studied. The disposal of inorganic pesticides should take place in abandoned mines while small amounts of relatively low-toxicity pesticides may be disposed of on sanitary landfills. Incineration constitutes the best way of disposing of organic pesticides.

74-0576. Greve, P. A.; Haring, B. J. A. (Lab. fuer Toxikol., Rijksinst. voor de Volksgezondheit, Utrecht,

The Netherlands). **Die mikrocoulometrische Bestimmung von organisch gebundenem Halogen in Oberflaechen- und anderen Gewassern. [Microcoulometric determination of organically bound halogen in surface and other waters.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 59-64; 1972.* (5 references) (German)

A Dobermann type instrument with direct injection of the petroleum ether or methylene chloride extracts and silver ion titration of the hydrogen halides present in the gases from the sample incinerator were used for the microcoulometric measurements. The average organically bound chlorine contents were 14.2 ppb with a minimum and maximum of 3.0 and 30.8 ppb in Rhine water samples taken from Nov. 1, 1971 through May 17, 1972. The average daily chlorine load of the Rhine was calculated as 1.5 tons. Twelve per cent of the total chlorine was found in the river silt. Rhine water infiltrated in sand dunes contained 0.6 ppb of organically bound chlorine; the corresponding level determined in rainwater was 0.3 ppb. Methylene chloride extracts from Rhine water contained 17.5 ppb of organically bound halogen; similar extracts from Maas and other surface waters featured 7.6 ppb and 6.2 ppb. The lower limit of detectability of the coulometric method is 2 ng of chlorine. Organically bound halogens, present in water in concentrations of 5 μg and over, can also be determined by potentiometric or biopotentiometric methods.

74-0577. Maier-Bode, H. (Pharmakol. Inst., Rhein. Friedrich Wilhelms-Univ., Bonn, Germany). **Verhalten von Herbiziden in Wasser, Schlamm und Fischen nach Applikation in Fischteichen. [Behavior of herbicides in water, muck, and fish after application in fish ponds.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 67-75; 1972.* (German)

The degradation and accumulation of the triazines, simazine, atrazine, terbulethylazine (2-chloro-4-ethylamino-6-*tert*-butylamino-*s*-triazine), ametryne, and terbutryne in water, muck, and fish were studied in fish ponds. The initial concentrations in the water were 1 and 0.5 ppm of simazine, 0.5 ppm of atrazine, 0.25 and 0.05 ppm of terbutryne, 0.05 ppm of ametryne, and 0.05 ppm of terbulethylazine. The simazine and terbutryne concentrations fell to or below 10% of the initial value within two weeks and to 1-4% of the initial concentration in 8 weeks. The reduction of the atrazine, ametryne, and terbulethylazine concentrations in water followed a similar pattern. The herbicide concentrations measured in the muck 4 days and 8 weeks after application were 180% and 50% of the respective initial water concentrations. The observed accumulation of simazine and terbutryne in algae and daphnia promoted accumulation of these herbicides in carp. However, the herbicide residue contents measured in edible parts of fish fell to the lower limit of detectability or lower by fishing time (about 70 days after herbicide application). Simazine and atrazine residue analyses revealed the unchanged substances along with their metabolites formed through dealkylation. Metabolites were not detected in ametryne, terbutryne, and terbulethylazine samples.

74-0578. Weil, L.; Quentin, K. E.; Jarrar, S. (Inst. fuer Wasserchem. und Chem. Balneol., Techn. Univ. Muenchen, Munich, Germany). **Adsorption von Pestiziden an Gewaessertruebstoffen. [Adsorption of pesticides on particulate matter in water.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 77-84; 1972.* (7 references) (German)

The adsorption of DDT, lindane, heptachlor epoxide, and dieldrin was studied on kaolinite, sodium-bentonite, and calcium-bentonite particles in water. A relatively low rate of sorption was determined. The sorption equilibrium was reached in about a month. The DDT sorption followed Freundlich's isotherm. The rate of sorption determined for dieldrin was too low to be of practical importance in surface waters. The adsorption was dependent on the pesticide loads of the water. The non-extractable portions of lindane, heptachlor epoxide, dieldrin, and DDT, adsorbed on kaolinite, were 50%, 68%, 69%, and 51%. The corresponding percentages for sodium-bentonite are 37%, 59%, 52%, and 58% and for calcium-bentonite, 41-46%, 35-69%, 32-58%, and 71-52%; the last figures in the latter as a function of the activation of calcium-bentonite.

74-0579. Verloop, A.; Noelle, H. H. (Forschungslaboratorium, N.V. Philips-Duphar, Weesp, The Netherlands). **Das Herbizid Dichlobenil und seine Abbauprodukte in Boeden und Gewaessern. [The herbicide dichlobenil and its breakdown products in soil and water.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 85-89; 1972.* (19 references) (German)

A large portion of applied dichlobenil is lost by evaporation. What is left in aquatic and terrestrial plants breaks down through hydroxylation and conjugation. Dichlobenil is hydrolyzed into 2,6-dichlorobenzamide and further converted into 2,6-dichlorobenzoic acid for further decarboxylation in the soil where the 2,6-dichlorobenzamide is taken up, hydroxylated, and conjugated by plants. The adsorption rate was reduced and the degradation rate increased in resistant aquatic plant species, compared to susceptible ones. Dichlobenil accumulated temporarily and then was rapidly eliminated in aquatic plants. Elimination of both dichlobenil and its metabolites and little evidence of metabolite residues were observed in fish. Initial dichlobenil concentrations of 0.5-1.5 ppm in water fell to or below 0.05 ppm in 2-3 months. Dichlobenil was eliminated from benthic muck in six months. 2,6-Dichlorobenzamide was not detected in fish.

74-0580. Bauer, U. (Inst. fuer Wasserforschung GmbH, Geisecke/Ruhr, Germany). **Verhalten einer Reihe von**

Pflanzenschutzmitteln bei der Grundwasseranreicherung durch Langsamsand filtration. [Behavior of some pesticides during groundwater supplementation by slow sand filtration.] *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 91-102; 1972.* (28 references) (German)

The retention of aldrin, *p,p'*-DDD, *o,p'*-DDT, *p,p'*-DDT, dieldrin, dimethoate, diuron, heptachlor, heptachlor epoxide, BHC, α-BHC, lindane, linuron, malathion, metasystox-I (methyl demeton), methoxychlor, telodrin, 1,2,4,5-tetrachlorobenzene, and endosulfan was studied during slow sand filtration as used for groundwater supplementation. The initial concentrations of organochlorine pesticides, malathion, dimethoate and metasystox-I, linuron, and diuron in the water were 1-10 ppb, 40-150 ppb, 2-5 ppb each, 1-2 ppm, and 0.2-2.0-20 ppm, respectively. The rate of filtration was 10 cm/h. Malathion was quantitatively eliminated from purified water mainly due to microbial breakdown. Diuron, linuron, dimethoate, metasystox-I, alpha-BHC, and lindane were only adsorbed a little if at all. The adsorption of the halogenated hydrocarbons with water solubilities below 1 ppm was very efficient. Malathion and metasystox-I were hydrolyzed. The preliminary gravel filter stage had an efficiency of about 50% for the halogenated hydrocarbons, and the subsequent sand filter was passed by less than 5% of the original doses of BHC, heptachlor, aldrin, endosulfan, *o,p'*-DDT, *p,p'* DDD, *p,p'*-DDT, and methoxychlor. The retention capacities of the sand filter were 46% for lindane and 70-88% for telodrin, dieldrin, 1,2,4,5-tetrachlorobenzene, alpha-BHC, and heptachlor epoxide. Pure quartz sand had a rather low retention capacity for halogenated hydrocarbons except for alpha-BHC and lindane.

74-0581. Huschenbeth, E. (Bundesforschungsanstalt fuer Fischerei, Inst. fuer Kuesten- und Binnenfischerei, Hamburg, Germany). **Chlorierte Kohlenwasserstoffe in Fischen. [Chlorinated hydrocarbons in fish.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 103-108; 1972.* (3 references) (German)

Organochlorine pesticide and PCB residues were determined in some 1,500 specimens of cod and other fish species from the North and Baltic Seas by GC and TLC. The DDT and total DDT residue levels in north Atlantic cod fillet samples ranged from 0.015-0.059 ppm and 0.037-0.173 ppm. The DDT and total-DDT concentrations in fish and the fish fat were directly related. The DDT and total-DDT contents in cod liver ranged from 0.7-15.5 ppm and from 0.9-31.7 ppm. The lindane and dieldrin residue levels in cod liver were almost always below 0.3 ppm. Sterilization of cod liver at 100 C in an autoclave strongly reduced the DDT content, slightly decreased the DDE content, considerably decreased the total DDT level, and considerably increased the DDD (TDE) residue. Frying and boiling also substantially decreased the total DDT content.

74-0582. Selenka, F. (Author address not given). **Ergebnisse ueber die Verunreinigung von Oberflaechengewaessern mit polychlorierten Biphenylen. [Findings on contamination of surface waters with polychlorinated biphenyls.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 113-120; 1972.* (16 references) (German)

General problems of environmental contamination with PCB are discussed, and actual PCB and organochlorine pesticide residue measurements in surface waters in West Germany are reported. While the PCB and organochlorine pesticide residue contents in surface waters are usually rather low, they represent serious environmental hazards due to their accumulation along the trophic chain. The process of accumulation in the trophic chain is characterized by a shift toward compounds with many chlorine atoms while low-chlorinated PCBs are more readily decomposed. Measurements of the PCB residues in the Rhine and Main Rivers, Lake Constance, and Lake Zurich in 1971/1972 revealed averages of 0.004 to 0.080 ppb with minima of 0.001-0.066 and maxima of 0.009-0.110 ppb. The daily endosulfan, lindane, and BHC burdens of the Rhine increased greatly during a rainy period following a drought. DDT did not increase significantly. The respective daily loads of endosulfan, DDT, and lindane during the rainy period were 1 kg, 300 g, and 16 to more than 20 kg.

74-0583. Zitko, V.; Hutzinger, O. (Environ. Canada, Fisheries, St. Andrews, New Brunswick, Canada). **Contamination of Canadian Atlantic coastal areas with polychlorinated biphenyls (PCB), polychlorinated terphenyls (PCT) and related compounds.** *Schriftenr. Ver. Wasser-Boden- Lufthyg. Berlin-Dahlem 37: 121-128; 1972.* (11 references)

Most samples of marine fish from Canada contained from 0.2 to 0.5 μg/g polychlorinated biphenyls (PCB), a finding similar to that observed in marine fish from Sweden. Freshwater fish from the U.S. were more contaminated than those from Sweden and most samples contained between 2.1 and 10.0 μg/g. PCBs in aquatic animals from the Bay of Fundy-Gulf of Maine area ranged from 0.07 μg/g in muscle of the basking shark to 3.38 μg/g in muscle of the double-crested cormorant. Highest levels were found in the liver of the white shark (218 μg/g), and *p,p'*-DDE residues were likewise highest in this tissue. The double-crested cormorant had *p,p'*-DDE levels of 162 μg/g in the fat and 8.4 μg/g in the muscle. From the PCB pattern observed in fish it appears that lower chlorinated biphenyls are selectively metabolized at high trophic levels. Polychlorinated terphenyls (PCT) were found only in eggs and fat of herring gulls.

74-0584. Jarczyk, H. J. (Pflanzenschutz Anwendungstechnische Abt., Farbenfabriken Bayer AG, Leverkusen,

Germany). **Ueber die Migration von Herbiziden in verschiedenen Bodenarten. [Migration of herbicides in various soil types.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 131-141; 1972.* (13 references) (German)

The migration of the herbicides chlorphenpropmethyl (Bidisin), methabenzthiazuron (Tribunil), metribuzin (Sencor), lenacil, and IPC (propham) in the soil was studied in laboratory and field tests. The laboratory tests were carried out with a 300 mm long column of soil with continuous percolation for 48 hr. The bulk of the pesticides was retained by the soil colloids within the upper 5-10 cm layer. The adsorption values, calculated from Freundlich's equation for methabenzthiazuron, chlorphenprop-methyl, metribuzin, lenacil, and IPC in different soil types, were in the ranges of 5.6-8.9, 8.7-9.8, 3.8-7.9, 2.5-10, and 6.6-10. Field tests with the same pesticides revealed upward and downward migrations of the herbicide residues in the soil as a function of the long-term precipitation conditions.

74-0585. Guth, J. A. (Division Agrarchemie, Ciba-Geigy AG, Basel, Switzerland). **Adsorptions- und Einwaschverhalten von Pflanzenschutzmitteln in Boeden. [Adsorption and leaching characteristics of pesticides in soil.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 143-154; 1972.* (15 references) (German)

The retention and leaching behavior of chlorbromuron, chlortoluron, diuron, fluometuron, metobromuron, monuron, ametryne, atrazine, prometryne, terbutryne, methidathion, and GS-13006 (*S*-(2-methoxy-5-oxo-Δ^2-1,3,4-thiadiazoline-4-yl methyl)-*O,O*-diethyl dithiophosphate) in different soil types were studied. The herbicides were placed on 30-cm soil columns which were then watered to correspond to 200 mm of rain in 48 hours. The compounds penetrated to depths of 8-24 cm, 8-28 cm, 4-18 cm, and 2-10 cm in four soil types. Penetration was lowest in the soil with the highest clay content. The logarithm of the depth of penetration was inversely proportional to the soil humus content. The depth of penetration was also inversely proportional to the adsorption constant of the pesticide. The depth of penetration exceeded 30 cm only for pesticides with adsorption constants less than unity.

74-0586. Niemann, P.; Maas, G. (Inst. Unkrautforsch., Biol. Bundesanst. Land- und Forstwirtschaft, Braunschweig, Germany). **Adsorption von Pestiziden an Ton- und Humuskolloide im Boden. [Adsorption of pesticides on soil clay and humus colloids.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 155-165; 1972.* (45 references) (German)

Studies on interactions between soil colloids and adsorbed pesticides along with factors influencing adsorption processes are reviewed. Both adsorption and desorption of pesticides may be influenced by the presence and nature of cations at the adsorption site. The formation of montmorillonite-cation-2,4-D complex was noted. Ion-dipole bonding takes place between phenylurea derivatives and cations. Adsorption of simazine and atrazine is reduced on clayey soil saturated with calcium, magnesium, potassium, and sodium ions. Protonation, hydrogen bridge formation, and competition of pesticides and other adsorbates are regarded as determining factors in adsorption processes. Surfactants may enhance or inhibit the adsorption of pesticides on soil components. The reduction in solubility of the active agent in the presence of electrolytes (salting out) may increase adsorption while salt cations may displace the protonated active agent from the colloid surface. A reduction in the sorption of amitrole with increasing calcium chloride concentration was observed. Water molecules and natural organic soil components may also modify pesticide adsorption.

74-0587. Sieper, H. (E. Merck, Chem. FO PFS, Darmstadt, Germany). **Verhalten von Lindan im Boden und im Wasser. [Behavior of lindane in soil and water.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 175-185; 1972.* (19 references) (German)

Persistence tests with different types of soils revealed relatively high water solubility and microbial degradability of lindane. Benthic sediments, algae, crustaceans, insects, and fish retained lindane at low rates. The retention of lindane was highest in soils with high loam contents and in light sandy soils where leaching is most intense. Lindane was rather rapidly metabolized into products of greatly reduced toxicity in water and especially in moist soils under anaerobic conditions. Microorganisms responsible for the metabolism of lindane include *Chlorella vulgaris, Chlamydomonas reinhardtii, E. coli,* and *Clostridium* species. Lindane is decomposed to carbon dioxide with gamma-pentachlorocyclohexene as an intermediary product. The average persistence of lindane in different soils and under different climatic conditions is 10 to 11 years.

74-0588. Nagl, H. G.; Korte, F. (Organisch-Chemisches Institut, Universitaet Bonn, Bonn, Germany). **Beitraege zur oekologischen Chemie - 48. Reaktionen von Dieldrin mit Stickstoffdioxyd und Ozon im ultraviolettem Licht. [Contributions to ecological chemistry - part 48. Reactions of dieldrin with nitrogen dioxide and ozone in UV light.]** *Tetrahedron 28(21): 5445-5458; 1972.* (18 references) (German)

The reactions of dieldrin with nitrogen dioxide and ozone in UV light were studied by IR mass spectrometric and NMR spectrometric methods, using column chromatography for isolation of the metabolites. Degradation products were isolated from solutions of dieldrin and nitrogen tetroxide in fluorocarbon after irradiation with long-wave UV light ($>$ 300 nm). Irradiation of solutions of dieldrin and nitrogen tetroxide in carbon tetrachloride under similar conditions yielded 5

compounds. One of these compounds was also detected after irradiation of a solution of dieldrin and ozone in fluorocarbon. In the presence of nitrogen dioxide gaseous dieldrin was mainly converted into photodieldrin by UV light. Irradiation of gaseous dieldrin in ozonized air, as in the ozone solution, yielded several products of higher molecular weight, which were not isolated. An additional compound, found in the urine of rats to which dieldrin was administered, was obtained by dehydrochlorination of one photodegradation product. Thus the structure of the metabolite could be confirmed by means of an NMR and UV spectrum of this product.

74-0589. Bullivant, M. J.; Pattenden, G. (Dept. Chem., Univ. College, Cardiff, Wales). **Photolysis of bioallethrin.** *Tetrahedron Lett. 38: 3679-3680; 1973.* (9 references)

Bio-allethrin, prepared from (+)-*trans* acid and (±)-alcohol, was converted in 90% yield to a single photoproduct in a di-π-methane rearrangement during irradiation in *n*-hexane, using a 100W medium pressure Hg arc and pyrex or quartz filtered light. Mass spectral data indicated a monomer and showed that the cyclopropane carboxyl moiety had been retained. NMR spectra contained no absorptions corresponding to the hydrogens of the prop-2′-enyl side chain, but had absorption due to cyclopropyl hydrogens. The rearrangement was completely quenched in the presence of 2,5-dimethylhexa-2,4-diene. Only *trans*-cyclopropane acid was recovered after saponification of the photoproduct and separation of the acidic material. The material produced by photolysis was not active in bioassays with mosquitoes and houseflies.

74-0590. Borneff, J. (Hygiene-Institute der Universitaet, Mainz, Germany). **Die Verunreinigung unserer Gewaesser und ihr Einfluss auf die Beschaffenheit des Trinkwassers. [Water pollution and its impact on drinking water quality.]** *Ther. Gegenw. 112: 7-25; 1973.* (German)

Surface waters are being increasingly used for drinking water supply. Problems of water pollution due to polycyclic aromatic carcinogens, metals, metalloids, phenols, detergents, and pesticides are surveyed with regard to impact on drinking water quality. The problem of contamination of surface waters with organochlorine pesticides such as DDT, lindane, aldrin, and dieldrin is due to the extensive persistence of these pesticides in the environment, including water, and to their accumulation via trophic chains. The DDT and lindane burdens in lakes and rivers are currently estimated at 0.01-0.1 and 0.001-0.01 μg/l. Endosulfan, α-BHC, β-BHC, and lindane are other nearly omnipresent substances in surface waters. Highly toxic, esterase-inhibiting organophosphorus pesticides may also be present in surface waters although they usually decompose in a few weeks. Partial destruction of pesticides in drinking water by ozonization was noted.

74-0591. Helweg, A. (Bakteriologisk afdeling, Statens Planteavls-Laboratorium, Denmark). **Chlorfenvinphos: bestandighed og indflytelse pa nitrogenomsaetningen i jord. [Chlorfenvinphos: persistence and influence on nitrogen metabolism in soil.]** *Tidsskr. Planteavl 76(4): 519-527; 1972.* (7 references) (Danish)

Persistence, degradation, and alterations of nitrogen metabolism were studied in natural and sterilized soils treated with chlorfenvinphos (technical grade containing 10% *cis* (alpha) and 85% *trans* (beta) isomers, as well as the pure isomers). Both isomers were much more persistent in sterile soils than in natural soils, indicating that breakdown is largely microbial. The degradation rate was not increased by incubation with suspensions of soils exposed to chlorfenvinphos for 6 months in a soil perfusion apparatus. The alpha isomer was less persistent than the beta isomer. When technical chlorfenvinphos was incubated at 25°C, about 20% of the alpha isomer and about 40% of the beta isomer remained after 170 days. When 100 ppm of the purified isomers were used, about 45% of the alpha isomer and almost 100% of the beta isomer remained after 112 days of incubation. Interconversion of isomers was not observed. Ammonification was not drastically altered by 10, 100, and 1,000 ppm concentrations of technical chlorfenvinphos. While 10 and 100 ppm concentrations had no influence on nitrification, 1000 ppm seemed to inhibit nitrification completely.

74-0592. Tokyo Metropolitan Government (Tokyo, Japan). **[Chapter 5: Solid Waste Countermeasures, Section III: Pesticide Pollution.]** *IN: Tomin o Kogai Kara Boei Suru Keikaku. (Plans for the Protection of Citizens from Public Nuisance) 1973, pp. 305-341.* (Japanese)

Persistence of residues after spraying of organochlorine pesticides decreases in the order of DDT, dieldrin, chlordane, heptachlor, aldrin, endrin, and gamma-BHC (lindane). Emulsions produce the highest residue levels, followed by solution and powder forms. When these chemicals are directly applied to soil, they tend to remain in root vegetables. In general, residues remain in the soil for more than three years. Soil residues decrease in the order of dieldrin, gamma-BHC, heptachlor, and aldrin. Organochlorine pesticides generally tend to accumulate in the fat tissues of the body. Alkylmercury compounds accumulate in the brain, especially in the nerve centers for vision and hearing and in the cerebellum. Phenyl mercurials are more likely to accumulate in the liver and kidneys rather than in the brain. This mercury causes inflammation of the skin. Mercury generally remains in the soil for many years. Pesticide residue standards for 28 vegetables are presented in a table.

74-0593. Sievers, D. M.; Lentz, G. L.; Beasley, R. P. (Engineering Dept., Univ. Missouri, Columbia, MO).

Movement of agricultural fertilizers and organic insecticides in surface runoff. *Trans. ASAE (Amer. Soc. Agr. Eng.) 13(3): 323-325; 1970.* (7 references)

The movement of insecticides applied as granules to experimental plots of three different soils appeared to be largely dependent on their rate of absorption by the clay and organic matter of the soil. The greatest amounts of heptachlor (and its epoxide) and aldrin were found in sediment of soil with low clay content, and aldrin was absorbed by the soil to a greater extent than heptachlor. Less heptachlor and aldrin were found in runoff water than in sediment. Phorate appeared in the sediment of all soils at about the same rate, and only small amounts (traces to 2.5 ppb) were found in runoff water. The loss of diazinon was influenced to some extent by clay content. Due to the use of corncob granules for this insecticide large losses occurred in poorly drained soil.

74-0594. Lakso, J. U.; Peoples, S. A.; Bayer, D. E. (Dept. of Physiol. Sci., Sch. of Vet. Med., Univ. of California, Davis, CA 95616). **Simultaneous determinations of MSMA and arsenic acid in plants.** *Weed Sci. 21(3): 166-168; 1973.* (18 references)

Monosodium methanearsonate (MSMA) and arsenic acid (AA) were measured simultaneously in johnsongrass (*Sorghum halepense* (L.) Pers.) and cottonseed (*Gossypium hirsutum* L. SJ-1) by a bicolorimetric method. Tissues from plants sprayed with MSMA while growing and tissues with MSMA and AA added just prior to extraction were analyzed. Johnsongrass sprayed with MSMA solution at 11.2 kg/ha contained, on a dry weight basis, 423.0 ppmw of MSMA and 0.00 ppmw of AA at 7 days and 10.83 and 0.21 ppmw, respectively, after 54 days of regrowth. The cotton plants were sprayed twice to runoff with MSMA, first with 0.3 g/l. and second with 1.2 g/l. Cottonseed from the sprayed cotton plants contained, on a dry weight basis, 2.45 ppmw of MSMA and 0.08 ppmw of AA after the first picking and 3.02 and 0.10 ppmw, respectively, after the second. Background levels of MSMA and AA were, respectively, on a dry weight basis, 0.63 and 0.02 ppmw in johnsongrass and 0.58 and 0.00 ppmw in cottonseed. (Author abstract by permission)

74-0595. Trifunovic, V.; Gajic, G.; Milovanovic-Nikolic, J. (Author address not given). **Otpadne vode iz industrije pesticida. [Wastewaters of the pesticide-manufacturing industry.]** *Zast. Mater. 19(10-11): 381-389, 1971.* (15 references) (Serbo-Croatian)

The properties and chemical composition of waste waters contaminated by DDT, parathion, and 2,4-D manufacture are described together with biological methods for purifying the waters. When its concentration of neutralized acids was 0.02-0.03%, waste water from DDT manufacture was successfully purified with activated sludge. The effect of waste water from DDT manufacture on purification of municipal water supplies is discussed. Data is presented for the toxicity of methyl parathion, ethyl parathion, and *p*-nitrophenol to fish. A pilot plant for purifying waste water from 2,4-D manufacture is described, and the results are discussed. A plant in Harston, England, which purifies waste water from a factory engaged in the production of herbicides (DNOC, TCA, and substituted phenoxyacetic acids), insecticides (DDT and organophosphorus compounds), and fungicides (copper and mercury salts) is described.

74-0596. Men'shikova, A. Z. (Dushanbe Inst. Epidemiol. Hyg., Dushanbe, USSR). **K gigiyenicheskoy otsenke produktov pitaniya, realizuyemykh na kolkhoznom rynke i v torgovoy seti g. Dushanbe. [On hygienic evaluation of food sold at the collective farm markets and in shops of Dushanbe.]** *Zdravookhr. Tadzh. 4: 31-33; 1973.* (Russian)

Vegetable samples from the markets and shops of Dushanbe were analyzed for DDT, BHC, carbaryl, dimethoate, and trichlorfon residues. Pesticide residues were detected in 19.7% of all samples. The DDT, BHC, carbaryl, dimethoate, and trichlorfon residue levels were in the respective ranges of 0.5-3 mg/kg, 0.5-3.0 mg/kg, 0.5-3 mg/kg, 0.5-1.5 mg/kg, and 0.5-1.5 mg/kg. The residue levels were higher in vegetables from small, independent producers than in those from large collective producers. The observance of rules imposed on the application of pesticides has resulted in a reduction of the pesticide residue levels by 5 to 6 times.

74-0597. Ladisch, H. (Hygiene-Institut des Bezirkes Halle, Halle, Germany). **Zur Kontamination von Huehnereiern mit chlorierten Kohlenwasserstoffen. [On the contamination of chicken eggs with organochlorine compounds.]** *Z. Gesamte Hyg. 17: 599-602; 1970.* (41 references) (German)

One hundred and eighty chicken eggs collected during the first half of 1970 were analyzed for organochlorine pesticide residues by a semiquantative thin-layer chromatographic method, using highly active magnesium silicate plates. The 180 eggs contained a total of 6.88 mg of DDT, 2.20 mg of DDE, and 2.31 mg of BHC. Based on the yearly per-capita egg consumption in East Germany (226 eggs), the yearly DDT, DDE, and BHC intake in eggs amounts to 8.65 mg, 2.78 mg, and 2.90 mg. While 21% of all eggs contained pesticide residues within the allowed limits (0.2 mg of DDT, 0.5 mg of BHC per kg), the residue levels exceeded the maximum allowable concentration in 27% of all samples. Some 52% of the samples were free from pesticide residues. Most of the pesticide-contaminated samples had DDT, DDE, and BHC levels in the ranges of 0.2-10 mg/kg, 0.2-5 mg/kg, and 10-15 mg/kg. BHC residues, determined with a sensitivity of 0.5 mg/kg, were present in only four eggs. The pesticide residues in eggs are due to the intake of contaminated grain, fish meal, and earthworms.

See also **74-0606** **74-0607** **74-0610** **74-0617** **74-0707** **74-0735** **74-0738** **74-0745**

74-0598. Erben, H. K. (Inst. fuer Palaeontol., Bonn, Germany). **Ultrastrukturen und Dicke der Wand pathologischer Eischalen. [Ultrastructure and wall thickness of pathological eggshells.]** *Akad. Wiss. Lit. Mainz Abh. Math-Naturwiss. Kl. 6: 193-216; 1972.* (48 references) (German)

Ultrastructures and wall thickness were examined microscopically in pathological eggshells of *Pelecanus occidentalis*, chickens, dinosaurs from France, *Testudo sulcata, Geochelone elephantopus elephantopus* from Galapagos, and *Athene noctua*. Considerable reductions in eggshell thickness due to organochlorine pesticides such as DDT, DDT metabolites, and Kepone (chlordecone) were found. Structural irregularities were also present and, in the case of DDT-damaged eggs, the number of vesicles was greatly increased. The increased fragility of DDT-contaminated eggshells is due to reduced wall thickness and increased globular inclusions. Kepone caused formation of a peculiar, thick layer of aragonite and vaterite, as well as thickening of the cuticular layer containing calcitic and vateritic globules with a reduced number of vesicles. A decrease in eggshell thickness leads to excessive fragility and increased evaporation of water from the egg; an increase in eggshell thickness, as in the case of "ovum in ovo" and "the aragonite egg," leads to blockage of shell pores, resulting in suffocation of the embryo. The reduction in eggshell thickness is explained by a depression of the estrogen level (with subsequent inhibition of carbonic anhydrase) while the pathological increase in shell thickness is due to vasotocin inhibition.

74-0599. Derban, L. K. A. (Dept. of Preventive and Social Med., Univ. of Ghana Med. Sch., Accra, Ghana). **Outbreak of food poisoning due to alkyl-mercury fungicide on southern Ghana State Farm.** *Arch. Environ. Health 28(1): 49-52; 1974.* (13 references)

A total of 144 cases of alkyl-mercury poisoning in rural Ghana were investigated. Out of ignorance, the patients had ingested maize which was dressed with ethylmercuric chloride and intended for sowing. They all showed the usual clinical features of alkyl-mercury poisoning, and 20 persons died. This incident demonstrates the serious health hazards involved in the agricultural use of alkyl-mercury compounds as fungicides in an unsophisticated rural community. Some recommendations for effective pesticide control are made. (Author abstract by permission)

74-0600. Baran, M. R. (Author address not given). **Onychopathie de contact aux produits phytosanitaires organo-synthetiques. A propos d'un cas au dinitro-orthocresol. [Contact onychopathy due to synthetic organic pesticides: a case history involving DNOC.]** *Bull. Soc. Fr. Dermatol. Syphiligr. 80(2): 172-173; 1973.* (3 references) (French)

Onychopathy following short-term (3 hrs) contact with a highly concentrated aqueous solution of DNOC in a 65-year-old male is described. The coloration of the fingernails changed about 15 days after contact, and after two months a distinct horizontal demarcation of the nail into two parts (a normal, pink distal part and a homogeneous, yellow to orange proximal part) was seen. Subungual edema persisted for 7 months when a whitish, pseudosebaceous substance, containing isolated malpighian cells, indicative of a keratinized orthokeratotic layer, was extracted. Tests for bacteria and fungi were negative. The proximal yellow coloration of the fingernails, progressing with nail growth, can be regarded as a characteristic feature of contact onychopathy due to highly concentrated synthetic organic pesticides.

74-0601. Firestone, D. (Div. Chem. Phys., Off. Sci., Bureau Foods, FDA, Washington, DC 20204). **Etiology of chick edema disease.** *Environ. Health Perspect. 5: 59-66; 1973.* (34 references)

Outbreaks of chick edema disease in 1957 and up until the middle 1960s were finally traced to dioxins, the most toxic of which was 2,3,7,8-tetrachlorodibenzo-*p*-dioxin, from by-product feed fats obtained during the processing of hides. Trichloro- and pentachlorphenol were used as preservatives in this process and have contained dioxins as contaminants. An outbreak of the disease in North Carolina in 1969 was traced to the feed fat contaminated at a vegetable oil refinery which also formulated antimicrobial water treatment products containing chlorophenols. Care must be taken in the use of chlorophenols in hide preservation, in industry, and on the farm to minimize dioxin contamination.

74-0602. Zarkevich, N. F.; Brusilovskiy, Ye. S.; Orlov, N. S. (Inst. Hyg. Toxicol. Pestic., Polymers, Plastic Materials, Kiev, USSR). **Otsenka funktsional'nogo sostoyaniya pochek s pomoshch'yu radioizotopnoy renografii pri nefropatiyakh khimicheskoy etiologii. [Evaluation of the functional state of the kidneys using radioisotope renography in nephropathies of chemical etiology.]** *Gig. Tr. Prof. Zabol. 17(3): 28-32; 1973.* (11 references) (Russian)

Isotope renography with ^{131}I-hippuran was used to examine renal function in 24 patients with allergic nephropathy and another 21 patients with toxic nephropathy of chemical etiology. Among the patients examined 28 had had contact with pesticides and 22 with other chemicals such as rubber and plastic components. The renograms showed no deviations from normalcy in 14 of the 50 cases. Changes on both renograms were recorded in 16 patients: 7 with toxic nephropathies, 6 with allergic nephropathies, and another 3 with conditions of obscure etiology. Unilateral functional changes in the kidneys were noted in 20 patients. Renography was useful in revealing latent disturbances of renal function, which are not infrequent in nephropathies of chemical etiology. Liver pain on pal-

pation, toxic nephritis with a nephrotic component, cholecystangiocholitis, and an encephalopolyneuritic syndrome were present in one patient with occupational exposure to polychlorocamphene (toxaphene). Isotope renography revealed a severe impairment of the excretory function of one kidney.

74-0603. Mirakhmedov, U. M.; Yusupov, B. Yu. (Dermatol. Venerol. Dispensary of the Sariassiysk District, Med. Inst., USSR). **Klinika dermatozov, vyzvannykh yadokhimikatami, u rabotnikov sel'skogo khozyaystva. [Clinical aspects of dermatoses caused by poisonous chemicals in agricultural workers.]** *Gig. Tr. Prof. Zabol. 17(3): 48-49; 1973.* (6 references) (Russian)

Dermatoses were studied in 53 male and 81 female farm workers, ages 19 to 55, who had been in contact with methyl mercaptophos, intrathion (thiometon), anthio (formothion), octamethyl (schradan), and butyphos (DEF) for 1 to 11 years. Dermatitis type skin alterations were found in 96 cases and eczema type in 38 cases. Edema, erythema, papulovesicular rash, erosion, cracks, and pustules were observed and were localized mostly in the face, neck, fingers, and forearm. After acute onset in most cases, the dermatoses lasted for 1.5 to 2 weeks (dermatitis), and for 5 to 6 weeks (eczema). Hypersensitivity to methyl mercaptophos, intrathion, anthio, octamethyl, and butyphos in 64, 20, 18, 16, and 16 cases, respectively, was determined during allergy tests. The pesticides in question were suspected of causing allergenic dermatitis.

74-0604. Anonymous. **Zastita od trovanja kod primene sredstava za zastitu bilja. [Control of poisoning from agents used in plant protection.]** *Jugoslov. Inost. Dok. Zast. Radu. 7(10): 1-19, 1971.* (Serbo-Croatian)

Measures considered to prevent pesticide poisoning include regulation of pesticide marketing, adequate labeling and inclusion of helpful information in enclosed circulars, packaging to ensure safe handling, adequate instructions to workers for their protection, and the use of protective equipment in agriculture. Measures recommended for monitoring the health of workers include medical examinations for exposed workers, establishment of criteria for selecting workers to handle toxic substances, and the organization and administration of first aid. The responsibilities of workers and labor organizations in preventing pesticide poisoning are discussed.

74-0605. Veltmann, G.; Muertz, R. (Med. Klinik Gerresheim, Staedtische Krankenanstalten Duesseldorf, Duesseldorf, Germany). **Diagnostik und Therapie exogener Vergiftungen. Hypnotika, Psychopharmaka, Aetzstoffe, Insektizide und Herbizide. [Diagnosis and therapy of exogenous poisonings with hypnotics, psychotropic drugs, caustic agents, insecticides, and herbicides.]** *Med. Monatsschr. 27(4): 160-165; 1973.* (11 references) (German)

Insecticides such as alkylphosphates and parathion and its derivatives inhibit the blood cholinesterase activity and cause muscular fasciculations, miosis, spasms, coma, and pulmonary edema. The first symptoms of poisoning appear 5 to 10 min after oral or pulmonary intake of these pesticides, which have a latency time of a few hours following skin resorption. The three phases of paraquat poisoning are headache and excitability, toxic liver and kidney lesions, and lung fibrosis, which is usually fatal in about 3 weeks in about 75% of all cases. Atropine should be administered i.v. in initial doses of 2 to 5 mg, continued with fractional doses of 1 mg each depending on the degree of miosis, and discontinued 24 to 48 hr after the poisoning symptoms have disappeared. When atropinization begins, 250 mg doses of obidoxime should be administered i.v. every two hours. Immediate and repeated gastric lavage, the introduction of fuller's earth or bentonite, and forced diuresis, whenever possible immediately after poisoning, are necessary. Specific therapy has not yet been elaborated for paraquat poisonings.

74-0606. Matthes, D.; Matthey, G. (Veterinaeruntersuchungs- und Tiergesundheitsamt, Jena, DDR). **Gefahren fuer Nutztierbestaende durch ungeordnete Muelldeponie. [Hazards to livestock caused by inadequate waste dumping.]** *Monatsh. Veterinaermed. 27(22): 875-876; 1972.* (German)

Two instances of cattle death due to ingestion of poisonous materials dumped on pastures are described. In a herd of 57 cattle, 3 died and 4 more became ill due to the ingestion of copper oxychloride neglectfully dumped on the pasture. High copper contents were determined in the rumen, liver, and kidney of the dead and emergency-slaughtered animals. The copper contents in the liver dry matter ranged from 500 to 1,760 ppm. In another instance, among 52 pregnant heifers 4 died and 16 more had to be emergency-slaughtered due to the intake on the pasture of arsenic-containing pesticide. Arsenic contents of 35-93 ppm in the liver and 9-18.3 ppm in the muscles were determined in the dead and emergency-slaughtered animals.

74-0607. Chase, H. P.; Barnett, S. E.; Welch, N. N.; Briese, F. W.; Krassner, M. L. (J. F. Kennedy Child Dev. Cent., Univ. Colorado Med. Cent., Denver, CO). **Pesticides and U.S. farm labor families.** *Rocky Mt. Med. J. 70(11): 27-31; 1973.* (14 references)

Mean serum levels of DDE, α-BHC, and β-BHC were significantly higher in adult migrant farm workers in Colorado than in adult urban controls. DDT levels were 2.7 times higher in farm workers than in controls, but the difference was not significant. Male farm workers had statistically higher levels of all pesticides than females, and this was believed to be due to greater

exposure. Dieldrin, lindane, aldrin, heptachlor, heptachlor epoxide, *o,p'*-DDT, and *o,p'*-DDE were not found. The crop being worked at the time of the study did not have as great an effect on serum pesticides as did the number of months worked. Levels of all four compounds increased with increasing age and were considerably lower in test children than in test adults. DDT levels were higher in women who had menstrual irregularities, but significant differences in DDT levels were only observed in adults having high blood pressure, and this could have been related to age.

74-0608. Anonymous. **Poisoning.** *S. Afr. Med. J. 47(22): 936; 1973.* (1 reference)

The need for care and health education in the area of accidental poisoning due to pesticides has been heightened by recent tragedies in South Africa. A survey of physicians indicated that government statistics did not accurately reflect the prevalence of such poisonings, and a declaration was made requiring that poisonings due to the manufacture, handling, accidental consumption, and use of insecticides and other pesticides in any form be made known to the proper officials. Such data is necessary for the proper functioning of poison centers.

74-0609. Blaszyk, P. (Pflanzenschutzamt Oldenburg, Landwirtschaftskammer Weser-Ems, Oldenburg, Germany). **Chemische Krautbekaempfung in und an Entwaesserungsgraeben aus der Sicht der Landwirtschaft. [Chemical weed control in and near drainage ditches from the viewpoint of agriculture.]** *Schiftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 187-192; 1972.* (German)

Assessment of the complex effect of chemical weed control in and near drainage ditches in the Weser-Ems region is given. The use of herbicides for ten years under practical conditions has not resulted in any damages to domestic animals, even though such animals were given water exclusively from drainage ditches with chemical weed control. The use of herbicides under unfavorable conditions or not in the proper manner caused a few fish deaths as well as negative effects on birds.

74-0610. Johannes, H.; Luedemann, D. (Ciba-Geigy, Frankfurt/Main, Germany). **Veraendert der Einsatz von Triazinen in Fischteichen die Wasserqualitatet? [Does the use of triazines in fish ponds alter the water quality?]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 201-210; 1972.* (19 references) (German)

Studies on the effects of triazines, especially simazine and terbutryne, on the physical, chemical, and biological properties of fish pond water, as well as on aquatic organisms, are reviewed. Observations of fish ponds which were treated with triazines for several years to control algae and aquatic plants did not reveal any permanent damage to the ecosystems. Herbicide application decreased oxygen content of the water and reduced both the number and the diversity of aquatic plant and algal species. Triazine residue investigations in benthic sediments, algae, muck, and fish demonstrate that triazines are safe when used properly.

74-0611. Jager, K. W. (Shell Nederland Raffinaderij NV and Shell Nederland Chemie NV, Rotterdam, The Netherlands). **Biochemisch en haematologisch patroon bij aan cyclodieen-insecticiden blootgestelde werknemers. [Biochemical and hematologic findings in workers exposed to cyclodiene insecticides.]** *Tijdschr. Soc. Geneesk. 49(22): 800-807; 1971.* (1 reference) (Dutch)

Studies are continuing on the health conditions of the workers employed in the insecticide factory of Shell Nederland Chemie. Statistical analysis of previously collected data on serum alkaline phosphatase, GOT, GPT, and LDH levels, as well as serum protein, hemoglobin, leukocyte count, and erythrocyte sedimentation rate, did not reveal any correlation between abnormalities in these parameters and insecticide level in the blood. Only the alkaline phosphatase values in subjects with blood insecticide levels above 0.20 μg/ml dieldrin equivalent differed from the average in unexposed persons, but the values were still within the normal range. The availability of automatic clinical analysis apparatus made it possible to compare a large number of biochemical values in 6 groups of workers with various insecticide exposures. The mean values and range of hemoglobin, hematocrit, leukocyte count, sedimentation rate, and cholinesterase activity did not differ between insecticide-exposed and unexposed groups of workers. Serum calcium was slightly higher and inorganic phosphate lower in the exposed groups although the values remained in the normal range. Cholesterol, uric acid, and glucose values were normal in all groups. Total protein serum and serum albumin were normal in all groups, but the values were higher in the exposed group. Differences in demographic composition of the groups may have been partially responsible for the differences in these values. Elevated bilirubin levels were noted in plastics production workers, but not in those exposed to pesticides.

74-0612. Brodersen, H. C.; Knolle, J.; Schoenborn, H.; Prellwitz, W.; Schuster, H. P. (Author address not given). **Klinisch-chemische und histologische Leberbefunde bei akuten Vergiftungen mit phosphororganischen Insecticiden. [Clinical-chemical and histological findings in the liver in acute organophosphorus insecticide poisonings.]** *Verh. Deut. Ges. Inn. Med. 77: 1217-1218; 1971.* (German)

Consequences of obidoxime (toxogonin) therapy in acute organophosphorus insecticide poisonings are

briefly described based on 45 cases of acute organophosphorus insecticide poisoning treated with toxogonin. Poisoning-specific enzyme disturbances were more frequent in patients who had recovered from or survived after the acute poisoning than in those who had died shortly after poisoning. No relationship could be established between the magnitude of the toxogonin doses applied and the extent of the pathologic changes. Fatty degeneration and siderosis were found on biopsy in six cases; autopsy revealed stasis and necrotic processes, hardly distinguishable from the usual postmortem ones.

74-0613. Viyevskaya, G. A. (Dept. Psychiatr., Vinnitsa Med. Inst., Vinnitsa, USSR). **O nervno-psikhicheskikh narusheniyakh u nakhodyashchikhsya v dlitel'nom kontakte s fosfororganicheskimi pestitsidami. [Nervous and mental disorders in persons being in prolonged contact with phosphororganic pesticides.]** *Vrach. Delo 9: 136-138; 1973.* (6 references) (Russian)

One hundred thirty male and female farm workers in contact with organophosphorus pesticides for at least 5 yr were examined for nervous and psychic symptoms due to prolonged exposure to such pesticides. Asthenia, vertigo, irritability, amnesia, fatigue, anxiety, and insomnia were observed in 62 subjects. The blood cholinesterase level in this group averaged 350 units compared to a control value of 620 units. Short-term affective personality changes with sudden, unreasoning terror, anxiety, heart palpitations, and photophobia were observed in 68 subjects. The psychic disturbances observed in workers after prolonged contact with organophosphorus pesticides can be classified as asthenic syndromes with deterioration of physical and mental status; affective syndromes accompanied by anxiety, excitability, protopathic fear, and aggressiveness; and additional polymorphic symptoms in the form of hysteria, violence, and hypochondria against a vascular background.

74-0614. Doroshchuk, V. P. (Dept. Clin. Toxicol. Neuroses, All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic., Polymers, Plastic Materials, Kiev, USSR). **Osnovnoy obmen pri porazheniyakh nervnoy sistemy vsledstviye vozdeystviya khlorirovannykh terpenov, TMTD i granozana. [Basal metabolism in lesions of the nervous system due to the effect of chlorinated terpenes, TMTD, and granosan.]** *Vrach. Delo 9: 138-140; 1973.* (Russian)

Changes in the basal metabolism were studied by spirographic tests in subjects with lesions of the nervous system following acute poisoning with polychloropinene and polychlorocamphene (toxaphene) and chronic exposure to TMTD (thiram), granosan, and mixtures of granosan, DDT, hexachlorane (BHC), trichlorfon, and metaphos (methyl parathion). Significant changes in the basal metabolism (±15 and more) were found in 28.5% of all patients with lesions of the nervous system. Increased basal metabolism with values ranging from -15 to +47 was determined in the group tested after acute poisoning with chlorinated terpenes. In the group with TMTD poisoning basal metabolism was between -13 and +29, averaging +7.2, and averaged +11.8 in subjects exposed to granosan. Both the changes in the basal metabolism and the degree of the nervous lesions were least pronounced in the group that had been exposed to a complex mixture of pesticides for several years. The changes in the basal metabolism were correlated with the degree of the lesion in the diencephalic region and can be a criterion of this pathology to a certain extent.

74-0615. Medovar, A. M.; Moskovko, G. I. (Author address not given). **Individual'naya zashchita rabotayushchikh s pestitsidami. [Individual protection of workers handling and applying pesticides.]** *Zashch. Rast. (Moscow) 2: 35-38; 1973.* (Russian)

Methods of preventing inhalation, skin absorption, and eye irritations in workers handling and applying pesticides are described. Gas-masks and breathers incorporating different types of adsorbents, as well as strips of absorbent cotton, are used during the application of fumigants. Skin protection, essential especially when organophosphorus, organomercury, and organochlorine pesticides and nitrophenol derivatives are applied, is possible by means of rubber boots, rubber gloves, and dust-tight overalls. Special air-tight goggles should be used to protect the eyes from pesticides.

74-0616. Matsueda, T.; Nagaki, M.; Tsukada, N.; Kudo, N.; Uchiyama, M. (Fac. of Culture, Hirosaki Univ., Hirosaki, Japan). **[Correlation between cholinesterase activity and glutathione in persons exposed to organophosphorus pesticides, during the season of no pesticide application.]** *Seikagaku 45(6): 308; 1973.* (Japanese)

Serum and erythrocyte ChE activity and the whole-blood glutathione (GSH) level were determined more than six months after the pesticide application season when residues of methyl parathion could scarcely be anticipated. These studies were conducted in a district where cases of intoxication due to organophosphorus pesticides, mainly methyl parathion, have occurred, and the average values were compared to those from healthy city dwellers. The serum ChE activity (ΔpH) of pesticide-exposed persons was 0.64 ± 0.03, clearly lower than the 0.91 ± 0.03 of controls. Erythrocyte ChE activities of exposed men and women were 0.43 ± 0.04 and 0.40 ± 0.04, respectively, also clearly lower (0.73 ± 0.04 and 0.56 ± 0.04) than those of controls. No significant difference was found between the whole blood GSH (mg/dl) of healthy persons (40.4 ± 1.89) and that of exposed persons (40.8 ± 2.09). Then 300 mg/day of GSH was administered p.o. to the exposed persons for four weeks, and the serum and erythrocyte ChE activities were traced over time. Both ChE activities were restored by the treatment; however, one week after GSH administration was stopped, the

activities returned to the state existing before administration. The whole blood GSH was directly proportional to GSH administered, but returned to the original value when the administration was stopped. The amount of p.o.-administered GSH incorporated by the erythrocytes was presumed to be less than 2%; however, this amount could significantly improve the function of the erythrocytes.

74-0617. Pilinskaya, M. A. (All-Union Res. Inst. Hyg. Toxicol. Pestic., Polymers, Plastic Materials, Kiev, USSR). **Chromosomal aberrations in persons handling ziram under industrial conditions.** *Sov. Genet. 6(7): 977-981; 1970.* (29 references)

English translation; for an abstract of the original Russian article, *Genetika* 6(7): 157-163; 1970, see Abstract No. 71-1875.

74-0618. Kuznetsov, P. A.; Zakharchenko, V. I. (Dept. Surg. Stomatol., Omsk Inst. Med., Omsk, USSR). **Izmeneniya tkaney i organov polosti rta pod deystviyem rtutnoorganicheskikh pestitsidov. [Changes in tissues and organs of the oral cavity under the action of mercury-organic pesticides.]** *Stomatologiya (Moscow) 52: 12-16; 1973.* (11 references) (Russian)

Initial and follow-up stomatological examinations of 231 workers occupationally exposed to granosan (Ceresan M) and phenylmercuric acetate (PMA) as well as inhalation tests carried out on rats with granosan are described. In workers in continuous contact with the mercurials the incidence of abnormalities of the dentomaxillary system was almost double that in workers of the control group. The respective incidences of gingival hyperemia, loosening, hemorrhagic diathesis, pathologic alterations of the dentogingival pockets, and lingual edema, determined in the test group prior to the spring work in the fields, were 8%, 22.2%, 5.7%, 23.6%, and 5.7%. The corresponding figures from the examinations performed after the sowing was completed were 37.9%, 49.5%, 30.7%, 31.7%, and 16.8%. Inflammatory processes were significantly increased. The workers occupationally exposed to granosan and phenylmercuric acetate displayed increases in the thresholds of taste, smell, and of the electrical excitability of the dental pulp. Data obtained in experiments on albino rats that were exposed to 0.012 mg/m^3 of mercury in the form of granosan for 1 to 135 days confirmed the clinical results.

See also **74-0520** **74-0523** **74-0525** **74-0528** **74-0542** **74-0545** **74-0547** **74-0575** **74-0592** **74-0693** **74-0711** **74-0712** **74-0713**

74-0619. Schewe, T.; Rapoport, S.; Boehme, G.; Kunz, W. (Inst. Physiol. und Biol. Chem., Humboldt-Universitaet, Berlin, DDR). **Zum Angriffspunkt des Systemfungizids Carboxin in der Atmungskette. [On the action site of the systemic fungicide carboxin in the respiratory chain.]** *Acta Biol. Med. Ger. 31(1): 73-86; 1973.* (27 references) (German)

The action site of carboxin was studied in isolated rat liver mitochondria and submitochondrial particles from beef heart (ETP - electron transport particles) and compared with that of thenoyl-trifluoroacetone (TTFA). Both inhibitors suppress succinate reduction of endogenous cytochrome b, external ubiquinone, and fluorimetrically detectable high-potential flavoproteins. In contrast, only TTFA, but not carboxin, prevented the succinate-induced reduction in the iron-sulfur-flavoprotein region of the mitochondrial respiratory chain. The succinate-phenazine methosulfate dichlorophenolindophenol electron transition, catalyzed by ETP, was inhibited only by TTFA. Soluble TTFA-sensitive succinate dehydrogenase from beef heart mitochondria was not influenced by carboxin. These findings, and the analysis of the simultaneous action of carboxin and TTFA on the succinate-ubiquinone oxidoreductase system of ETP, suggest the existence of different, but neighboring inhibitory sites for the two inhibitors. The action site of carboxin is concluded to be located in the iron-sulfur region of complex II of the electron transport system, on the oxygen side of the TTFA action site, but on the substrate side of both ubiquinone and cytochrome b.

74-0620. Brostroem, J. (Inst. Cancer Res., Danish Cancer Soc., Radiumstationen, DK-8000, Aarhus C, Denmark). **Diisopropylfluorophosphate uptake by granulocytopoietic cells in chronic myeloid leukaemia and in normal individuals.** *Acta Haematol. 50(3): 143-148; 1973.* (9 references)

Diisopropylfluorophosphate-3H (DFP) was taken up in essentially the same way by neutrophilic myeloid cells (bone marrow) from three normal individuals and three Philadelphia chromosome-positive patients with chronic myelogenous leukemia. Promyelocytes had the highest and myeloblasts the lowest grain counts. Myelocytes contained a somewhat lower count than promyelocytes and uptake in metamyelocytes and mature forms was about half that of the promyelocytes. Systematic investigation of incorporation in monocytes, eosinophils, lymphocytes, and erythropoietic cells was not performed, but uptake in these cells was very low. Considerable variation was encountered within a cytological classification.

74-0621. Kosinkiewicz, B. (Inst. Soil Sci. Agr. Chem., Agr. Univ., Wroclaw, 50-373, Poland). **The effect of linuron and chlorpropham on glutamic acid production by *Arthrobacter globiformis*.** *Acta Microbiol. Pol. Ser. B 5(4): 145-150; 1973.* (9 references)

During a 50-hr incubation 4 ppm linuron and 30 ppm chlorpropham inhibited the growth of *Arthrobacter globiformis* 2 and 3 times, respectively, in shaken cultures. The pesticides were bacteriostatic under conditions of low aeration, but were ineffective after five days of incubation when cultures were shaken on a high-speed rotary shaker. Linuron and chlorpropham increased glutamic acid production by the organism, and the highest amount of the amino acid was obtained from media containing 30 ppm chlorpropham. When the pesticides were introduced into 24-hr culture of *A. globiformis*, no effects on growth or glutamic acid production were observed. Neither compound was found in the supernatants or bacterial cells after 50 hr of incubation, but products of their degradation were found in the supernatant.

74-0622. Luton, J. P.; Remy, J. M.; Valcke, J. C.; Laudat, P.; Bricaire, H. (Cent. Rech. Endocrinol., Hopital Cochin, Paris, France). **Guerison ou remission de la maladie de Cushing par usage therapeutique prolonge d'*o,p'*-DD (a propos de 17 observations). [Recovery or remission of Cushing's disease following long-term administration of *o,p'*-DDD in seventeen patients.]** *Ann. Endocrinol. 34(4): 351-376; 1973.* (29 references) (French)

Seventeen patients with Cushing's syndrome (bilateral adrenal hyperplasia) of central nervous origin were treated for 5 to 23 months (average 9 months) with daily 8-12 g doses of *o,p'*-DDD (TDE). All symptoms of Cushing's syndrome except for osteoporosis disappeared completely in 6 of the 17 patients, and regression of the hypercortisolism symptoms was observed during *o,p'*-DDD treatment. The treatment failed to alter normal thyroid function, and only one case of hypothyroidism of obscure origin was noted. The *o,p'*-DDD caused no appreciable change in the corticotropic hormone secretion, but it normalized the menstrual cycle and increased the blood cholesterol and triglyceride levels. Apart from anorexia in one case and urticarial erythema in another, all patients showed good tolerance for *o,p'*-DDD. No neurologic, hematologic, or renal disorders due to the prolonged administration of *o,p'*-DDT were noted. Ten patients exhibited complete hypercortisolism regression 12 to 32 months after the drug had been withdrawn.

74-0623. Casida, J. E. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA). **Insecticide biochemistry.** *Annu. Rev. Biochem. 42: 259-278; 1973.* (140 references)

The reactions of insecticides at the molecular level in target and non-target organisms are reviewed. The primary action of organophosphates and methylcarbamates is inhibition of AChE activity in the central nervous system, achieved by esterification of the enzyme or just by initial lipophilic bonding in the area around

the anionic site or charge-transfer complex formation. A small number of these compounds also esterify membrane sites that may be associated with neurological and developmental anomalies in vertebrates. Some in vitro effects on DNA have also been observed. Various sites in the mitochondrial electron transport chain, affecting respiratory metabolism, are influenced by rotenone, triorganotins, and hydrogen cyanide and its precursors. The primary activity of organochlorine and pyrethrum insecticides does not seem to be a result of inhibition of ATPase and other biochemical effects observed with these chemicals. The detoxification mechanism rather than response of target sites accounts for synergistic effects and differences in sensitivity, between species and between resistant and susceptible strains.

74-0624. Siddaramappa, R.; Rajaram, K. P.; Sethunathan, N. (Dept. Soil Microbiol., Cent. Rice Res. Inst., Cuttack-6, Orissa, India). **Degradation of parathion by bacteria isolated from flooded soil.** *Appl. Microbiol. 26(6): 846-849; 1973.* (13 references)

Two bacteria, *Bacillus* sp. and *Pseudomonas* sp., were isolated from parathion-amended flooded alluvial soil which exhibited parathion-hydrolyzing ability. *Bacillus* sp. readily liberated nitrite from the hydrolysis product, *p*-nitrophenol, but not from intact parathion. *Pseudomonas* sp. hydrolyzed parathion and then released nitrite from *p*-nitrophenol. These studies establish bacterial degradation of parathion past the *p*-nitrophenol stage to the end product, nitrite. (Author abstract by permission)

74-0625. Mieth, K.; Beier, D.; Losch, K. (Bezirksinstitut f. Veterinaerwesen, Wusterhausen (Dosse), DDR). **Untersuchungen mit Phosphorsaeureesterpraeparaten beim Rind, Schwein und Schaf, unter besonderer Beruecksichtigung der Cholinesteraseaktivitaet. 2. Mitteilung: Der Einsatz der Phosphorsaeureesterpraeparate und deren Einfluss auf die Azetylcholinesteraseaktivitaet beim Rind. [Studies on organophosphorus preparations in cattle, pigs and sheep, with special reference to cholinesterase activity. II. Use of organophosphorus preparations in cattle and their effect on acetylcholinesterase activity.]** *Arch. Exp. Vet. Med. 27(2): 371-381; 1973.* (German)

Studies on the insecticidal efficiency of various organophosphorus preparations and their effects on the blood acetylcholinesterase activity in cattle are described. The pour-on, oral, spray, i.m., i.v., and s.c. applications of various organophosphorus preparations in cattle for insect control inhibited the acetylcholinesterase activity by anywhere between 8 and 70% and sometimes even totally. Measurement of acetylcholinesterase activity before dosing showed normal values increasing with age from 1,418 IU in 1-10 days-old cattle to 1,830 IU in one-year-old and older cattle. The cattle were subsequently treated with hypodix, trichlorfon, hypobovin, and dimethoate solutions by using the pour-on, spray, or wash technique. The maximum rates of acetylcholinesterase inhibition due to 1 and 2% trichlorfon and 0.5, 1, and 3% dimethoate solutions, applied according to the wash and spray techniques, were 21%, 16-32%, 33%, 36-45%, and 84-85%, occurring 7, 8, 56-72, 19-24, and 4 hr after pesticide application. The pour-on application of hypodix, hypobovin, and 6% solution of trichlorfon caused maximum acetylcholinesterase activity inhibition in 5-48 hr with values ranging from 11 to 59%. The degree of the acetylcholinesterase inhibition was indicative of the degree of the systemic activity of the preparations against warble fly larvae.

74-0626. Azarnoff, D. L.; Svoboda, D. J. (Clin. Pharmacol.-Toxicol. Cent., Dept. Med., Univ. Kansas Med. Cent., Kansas City, KS). **Microbodies in experimentally altered cells. VI. Thyroxine displacement from plasma proteins and clofibrate effect.** *Arch. Int. Pharmacodyn. 181(2): 386-393; 1969.* (35 references)

Clofibrate at 0.25% in the diet of rats significantly decreased serum cholesterol, but not when rats were previously thyroidectomized. Novobiocin, 2,4-D, trypan blue, and aspirin did not alter serum cholesterol. Clofibrate also markedly increased liver catalase activity and markedly decreased L-α-hydroxy acid oxidase and *d*-amino acid oxidase activity in intact and thyroidectomized rats. Mitochondrial protein and mitochondrial oxygen uptake were increased by treatment with clofibrate. Proliferation of microbodies was observed in intact and thyroidectomized rats in the clofibrate group and to a limited extent in the aspirin group, but not in the other treatment groups. Since all the test compounds are able to displace thyroxin from its plasma protein, it is not likely that thyroid hormone displacement is responsible for the proliferation of microbodies induced by clofibrate.

74-0627. Schoene, K.; Oldiges, H. (Inst. Aerobiol., Frauenhofer-Gesellschaft Foerderung angewandten Forschung e.V., D 5949 Grafschaft, Sauerland, Germany). **Die Wirkungen von Pyridiniumsalzen gegenueber Tabun- und Sarinvergiftungen in vivo und in vitro. [Effects of pyridinium salts against tabun and sarin poisonings in vivo and in vitro.]** *Arch. Int. Pharmacodyn. 204(1): 110-123; 1973.* (19 references) (German)

The antidotal efficacy of 37 pyridinium salts in tabun and sarin poisoning was studied in vivo (mice) and, in the case of tabun, in vitro. Against tabun only 7 compounds were effective, whereas, in general, the antidotal potency of pyridinium oximes against the sarin intoxication proved to be much higher. Reactivation experiments in vitro suggest that the poor reactivation of tabun-inhibited acetylcholinesterase is caused by both low reactivity and affinity of the oximes towards the

phosphorylenzyme. The protective potency of the pyridinium salts depends upon the structure of the alkylphosphate used for intoxication: optimal effects were achieved against sarin poisoning by HI 6 and in the tabun intoxication by TMB 4. In former investigations toxogonin proved to be the most effective reactivator in the paraoxon intoxication whereas optimal protection against soman was obtained with the compound SAD 128. (Author abstract by permission)

74-0628. Bachofer, R.; Oltmanns, O.; Lingens, F. (Inst. Mikrobiol. Molekularbiol., Univ. Hohenheim, D7000-Stuttgart, Germany). **Isolation and characterization of a *Nocardia*-like soil-bacterium, growing on carboxanilide fungicides.** *Arch. Mikrobiol. 90: 141-149; 1973.* (19 references)

A bacterium, designated A 1, was isolated from both an *o*-toluanilide (OTA) and a 2,5-dimethyl-furan-3-carboxanilide (FCA) soil enrichment culture and found capable of utilizing the systemic fungicides OTA, *o*-iodobenzanilide, FCA, carboxin, and oxycarboxin as sole sources of carbon and nitrogen. Growth was also observed in a mineral-salts medium with aniline, acetanilide, isopropyl-*N*-phenylcarbamate (propham), phenol, paraffin, and other carbon sources. The organism was aerobic, Gram-positive when young, did not form true mycelium, and generally resembled, but was not congruent with, *Nocardia globerula, N. rubropertincta*, and *N. rubra.*

74-0629. Engelhardt, G.; Wallnoefer, P. (Bayerische Landesanstalt fuer Bodenkultur Pflanzenbau, D-8000 Munich 19, Germany). **Transformation of *o*-toluate in *Pseudomonas putida* isolate 1065 and *Rhizopus japonicus* ATCC 24792.** *Arch. Mikrobiol. 93(3): 229-237; 1973.* (25 references)

Pseudomonas putida isolate 1065 and *Rhizopus japonicus* ATCC 24794 were the only microorganisms of 36 isolated from soil capable of degrading *o*-toluate and 2-chlorobenzoate to a lesser extent. These compounds are products of the hydrolysis of systemic fungicides *o*-toluanilide and 2-chlorobenzanilide. The principal metabolites of *o*-toluate were 2-hydroxymethylbenzoic acid in the case of *P. putida* and 2-hydroxymethyltoluene in the case of *R. japonicus.* Phthalide was also isolated from the medium of *P. putida.* Conversion by *P. putida* began in the stationary phase of growth while reduction by *R. japonicus* started in the early exponential phase of growth.

74-0630. Byczkowski, J.; Swierczynski, J.; Popinigis, J. (Dept. Biochem., Med. School, Gdansk, Poland). **The effect of *p,p'*-DDT (dicophane) and its metabolites on ATPase activity in rat liver mitochondria.** *Arch. Toxikol. 31(1): 19-24; 1973.* (20 references)

ATPase activity in intact rat liver mitochondria was stimulated about 6-fold by DDA and about 4-fold by DDT, DDE, and DDOH at 100 μM. Mg^{2+} had no effect on the stimulation by DDA, suggesting a DPN-like effect, but DPN caused a greater increase in activity. DDE and DDT produced colloidal precipitates when added to the incubation mixture. Oligomycin abolished the stimulatory action of all of the DDT-like compounds. None of the compounds stimulated ATPase activity in mitochondria damaged by sonication.

74-0631. Faff, J.; Rabsztyn, T.; Rump, S. (Dept. Toxicol., Military Inst. Hyg. Epidemiol., Warsaw 86, Poland). **Investigations on the correlation between abnormalities of neuromuscular transmission due to some organophosphates and activity of acetylcholinesterases in the skeletal muscle.** *Arch. Toxikol. 31(1): 31-38; 1973.* (18 references)

The correlation between abnormalities of neuromuscular transmission due to some organophosphates and activity of acetylcholinesterase in sketetal muscle has been studied. A very close correlation was found between these two events in cases of poisoning with all organophosphates tested, though the abolition of tetany was also proportional to the frequency of stimulation. The decrease in tetany due to phospholine was seen when smaller percentage of acetylcholinesterase was inhibited than with fluostigmire (DFP) or phospholine tertiary analog. It is supposed that these abnormalities of neuromuscular transmission are connected mainly with acetylcholinesterase inhibition. Differences in activity of that enzyme accompanied by similar decreases in tetany due to different organophosphates are explained in terms of another relation between extra- and intracellular acetylcholinesterase in the total inhibited enzyme in these cases. (Author abstract by permission)

74-0632. Stern, P.; Tomic, S. (Dept. Pharmacol., Med. Fac., 71001 Sarajevo, Yugoslavia). **Attempted treatment of tri-*ortho*-cresyl phosphate intoxication with a water-soluble protein-free extract of mammalian heart muscle.** *Arch. Toxikol. 31(1): 89-92; 1973.* (18 references)

Oxotremorine afforded slight protection against paralysis induced by 100 mg/kg tri-*o*-cresyl phosphate (TOCP) at doses that were not toxic to cocks. R, a water-soluble protein-free extract of mammalian heart muscle which augments coronary blood flow, protected 10 out of 12 cocks from TOCP paralysis. The increases in choline acetylase activity caused by these compounds probably are not responsible for the protective effect since oxotremorine causes a greater activation of choline acetylase than R.

74-0633. Neskovic, N.; Vitorovic, S.; Plesnicar, M. (Pestic. Dept. INEP,Baranjska 15, Zemun, Yugoslavia). **The role of liver microsomal enzymes in the metabolism of parathion.** *Biochem. Pharmacol. 22(3): 2943-2946; 1973.* (17 references)

The involvement of microsomal enzymes in the metabolism of the organophosphorus insecticide diethyl *p*-nitrophenyl phosphorothionate (parathion) by rat liver was studied. The effect of parathion on the activity of NADPH-and NADH-cytochrome *c* reductases in hepatic microsomes isolated from untreated and phenobarbital pretreated rats was determined. The results demonstrate that both NADH- and NADPH-linked (microsomal) electron transport components are involved in the oxidative metabolism of parathion. Phenobarbital pretreatment increased the rate of parathion metabolism. The activity of microsomal NADH-cytochrome *c* reductase was significantly higher than that of NADPH-cytochrome *c* reductase. Parathion had an inhibitory effect on both enzymes when applied directly to the microsomal suspension. (Author abstract by permission)

74-0634. Schoene, K. (Inst. Aerobiol. Fraunhofer-Gesellschaft Foerderung angewandten Forschung, D 5949 Grafschaft/Hochsauerland, Germany). **Phosphonyloxime aus Soman; Bildung und Reaktion mit Acetylcholinesterase in vitro. [Phosphonyl oximes from Soman; formation and reaction with acetylcholinesterase in vitro.]** *Biochem. Pharmacol. 22(23): 2997-3003; 1973.* (16 references) (German)

The reactivation of acetylcholinesterase (AChE), inhibited by stoichiometric amounts of *O*–1-methyl-2,2-dimethylpropyl-methylfluorophosphonate (Soman) under conditions preventing rapid aging, was studied with several pyridiniumoximes. The most potent reactivator, HS 6, induced reactivation over the whole range of oxime concentrations tested (5×10^{-5} *M* to 5×10^{-2} *M*). Toxogonin, TMB 4, 2-PAM, and some other related compounds, when applied in concentrations below 1×10^{-3} *M*, produced additional inhibitory effects. After reacting the enzyme with equimolar amounts of Soman under conditions favoring the aging process, the reaction mixture contained only AChE, non reactivable phosphonyl-AChE, and the Soman stereoisomers of low anticholinesterase activity. These Soman isomers reacted with oximes to form oximephosphonates which are potent inhibitors of AChE. (Author abstract by permission)

74-0635. Bay, E.; Adams, N. L.; Von Bredow, J. K. D.; Nelson, J. D. (Dept. Army, Edgewood Arsenal, APG, MD 21010). **Respiratory phase shift of pattern in the medullary reticular formation after soman in the cat.** *Brain Res. 60(2): 526-532; 1973.* (17 references)

A shift of phase pattern of the medullary respiratory neurons was observed following administration of soman intravenously in cats which had been treated with drugs and surgery to eliminate complicating effects of higher brain centers, peripheral muscarinic activity, etc. Control cathode ray oscilloscope tracings showed that the respiratory neuron fired at the same time that the phrenic nerve discharged, suggesting that the neuron is an inspiratory unit. Tracings obtained after administration of soman (60 μg/kg) reveal a gradual transition from this state to one of firing during expiration. That the effect was due to a change in blood gas composition was ruled out by experiments in which blood pressure was reduced with a ganglionic blocking compound and no change in phase was observed.

74-0636. Naqvi, S. M.; De la Cruz, A. A. (Dept. Zool., Mississippi State Univ., P.O. Drawer Z, Mississippi State, MS 39762). **Mirex incorporation in the environment: toxicity in selected freshwater organisms.** *Bull. Environ. Contam. Toxicol. 10(5): 305-308; 1973.* (9 references)

The toxicity of mirex was determined to specimens of a species of amphipod, a dragonfly nymph, a gyrinid beetle, a water strider, and a shrimp collected from a pond and a lake not directly treated with the insecticide but located in treated counties. Shrimp, with an LD50 at 72 hr of 1.01 ppm, were less susceptible than the water strider, 24-hr LD50 of 0.13 ppm, or the gyrinid beetle, 24-hr LD50 of 206 ppm. After 600 hr exposure to 1.0 ppb 53% mortality was observed with the amphipod, *Hyallela azteca*, and after 48 hr exposure to 1.0 ppm, 48% mortality was observed in dragonfly nymphs.

74-0637. Berstein, J. D.; Johnston, S. L. (Dept. Biochem., Univ. Maine, Orono, ME 04473). **Effects of diphenylhydantoin upon estrogen metabolism by liver microsomes of DDT-treated Japanese quail.** *Bull. Environ. Contam. Toxicol. 10(5): 309-314; 1973.* (9 references)

DDT at 100 ppm and DDT plus diphenylhydantoin (DPH) at levels ranging from 130 to 1040 ppm increased liver weight and microsomal protein in male and female Japanese quail. Metabolism of estradiol-17 β by total female liver microsomes was reduced at the lowest level of DPH, due to a decrease in per mg activity not overcome by an increase in weight. All other levels increased estradiol-17 β metabolism by total liver microsomes. DPH did not have any adverse effects on general health, but did reduce excitability and aggressive behavior. Further study may show it to be suitable for mitigating the effects of DDT on avian reproduction.

74-0638. Petrocelli, S. R.; Hanks, A. R.; Anderson, J. (Dept. Biol., Texas A&M Univ., College Station, TX 77843). **Uptake and accumulation of an organochlorine insecticide (dieldrin) by an estuarine mollusc, *Rangia cuneata*.** *Bull. Environ. Contam. Toxicol. 10(5): 315-320; 1973.* (19 references)

Measurable uptake and accumulation of dieldrin by the estuarine clam, *Rangia cuneata*, was demonstrated in water containing extremely low levels and considered to be safe. At levels of dieldrin ranging from 0.40 to 1.67 μg/l. of artificial sea water, an average

200-fold concentration was observed in 36 hr and 800-fold concentration was observed in 72 hr. Uptake was slower in the first 24 hr than in the following 48 hr, probably because of the lower siphoning action generally encountered when a new substance is introduced. The highest level in the meat of the clam was 1226 μg/kg.

74-0639. Dvorchik, B. H. (Dept. Pharmacol. Therapeut., Univ. Florida College of Med., Gainesville, FL). **Binding, fate, and toxicity studies of ^{14}C-2,2-bis (*p*-chlorophenyl)-1,1,1-trichloroethane (*p,p*-DDT) in the dogfish, *Squalus acanthus*.** *Bull. Mt. Desert Island Biol. Lab. 11: 7-10; 1971.*

Labeled DDT, equilibrated with plasma from dogfish, was distributed in all fractions with most occurring in the lipid-chylomicron and the very low density lipoprotein. The pesticide appeared to be at least 99% bound. Following administration of 60 μg/kg ^{14}C-DDT to dogfish intra-arterially, approximately 85% of the dose was found in the liver from day 2 to day 17. About 95% of the radioactivity in the liver was DDT, and 2-3% was DDE. Greater than 50% of the liver weight is accounted for by liver oil, and this is believed to sequester the DDT present in the liver, making it unavailable to the hepatic cells for metabolism. The maximum non-lethal dose for dogfish was 2 mg/kg, and much lower levels of DDT in brain were observed in dogfish which died than in rats.

74-0640. Guarino, A. M.; Janicki, R. H.; Kinter, W. B. (Lab. Chem. Pharmacol., Nat. Cancer Inst., Bethesda, MD). **Distribution and metabolism of ^{14}C-DDT in the eel (*Anguilla rostrata*) after six hours of uptake from ambient water.** *Bull. Mt. Desert Island Biol. Lab. 11: 23-24; 1971.*

Uptake of DDT by eels held in 2 l. of fresh or sea water containing 0.1 ppm ^{14}C-DDT averaged about 56% after about 6 hr. Tissues contained approximately the same percentages of radioactivity in sea-water and fresh-water adapted animals. The concentration of total DDT of most tissues exceeded that in the ambient water, and in the case of plasma, the levels were 40 to 50 times greater. Most of the 30 ppm of material found in the liver occurred as the parent compound, about 10% was TDE, and 8% DDE plus DDA. About 10 ppm was found in the brain, and hyperactivity and convulsions were observed in all eels. Gill and gut mucosa levels were 20 and 6 ppm respectively.

74-0641. Guarino, A. M.; Pritchard, J. B.; Call, J. B.; Bering, H. A.; Rall, D. P. (Lab. Chem. Pharmacol., Nat. Cancer Inst., Bethesda, MD). **Distribution of ^{14}C-DDT in the lobster after administration via intravascular or oral routes or after exposure to DDT-containing sea water.** *Bull. Mt. Desert Island Biol. Lab. 11: 29-31; 1971.*

Hepatopancreas of lobsters injected intravascularly with 0.1 mg/kg ^{14}C-DDT contained 63.4% of the administered radioactivity after 34 days, 90% of which was DDT itself. The egg mass and tasl muxcle also accumulated some DDT. From 95 to 97% of the absorbed dose was found in the hepatopancreas of lobsters fed 0.1 mg/kg or exposed to water containing 0.1 ppm ^{14}C-DDT for 1 wk. Tissue distribution was approximately the same as that found after pericardial injection.

74-0642. Janicki, R. H.; Kinter, W. B. (Upstate Med. Cent. Syracuse, NY). **DDT, DDE, and DDD: effects on ATPase activity in the rectal gland of the dogfish shark (*Squalus acanthias*).** *Bull. Mt. Desert Island Biol. Lab. 11: 49-51; 1971.*

DDT, DDE, and TDE(DDD), at 50 ppm, did not significantly inhibit Na^+, K^+, $Mg,^{2+}$-ATPase activity in *S. acanthias* rectal gland, an unexpected finding since these enzymes from teleosts were inhibited by the organochlorines. Mg^{2+}-ATPase from the rectal gland of *S. acanthias* was inhibited by DDT, DDE, and TDE (DDD). The inhibition curve flattens out at about 50 ppm organochlorine, suggesting the presence of more than one enzyme. It is possible that residues in *S. acanthias* are already approaching those capable of causing some inhibition of Mg^+ ATPase.

74-0643. Janicki, R. H.; Kinter, W. B. (S.U.N.Y. Upstate Med. Cent., Syracuse, NY). **DDT and the disruption of osmotic regulation in sea-water adapted eels (*Anguilla rostrata*).** *Bull. Mt. Desert Island Biol. Lab. 11: 51-53; 1971.*

Eels maintained in sea water and exposed to DDT at 1 ppm for 3 hr showed a significant increase in plasma K^+, but no increase in osmolality or Na^+. Significant increase in plasma osmolality, Na^+, and K^+ concentrations were observed after 6 hr exposure, and these changes were accompanied by hemolysis, an increase in respiratory activity, and convulsions. DDT also impaired the ability of eel gill filaments in vitro to maintain a Na^+ gradient against sea water, an effect also seen with 2,4-dinitrophenol and ouabain. Na^+, K^+, Mg^{2+} -ATPase was inhibited approximately 60% by 50 ppm DDT. These results suggest that osmoregulatory disruption is involved in the toxicity of DDT in teleosts. The conclusion is supported by the fact that mortality due to DDT was delayed in killifish maintained in fresh water, when compared to that observed for killifish maintained in sea water.

74-0644. Merkens, L. S.; Kinter, W. B. (S.U.N.Y. Upstate Med. Cent., Syracuse, NY). **Acute toxicity of a mixture of polychlorinated biphenyls (Aroclor 1221) and DDT in a marine teleost (*Fundulus heteroclitus*) and effect on serum osmolality, Na^+ and K^+.** *Bull. Mt. Desert Island Biol. Lab. 11: 64-68; 1971.*

Aroclor 1221 in sea water was about 100 times less toxic to the teleost *F. heteroclitus* than DDT. Mortality appeared to be dose-related in both cases, but the actual dose was not known since precipitation of the compounds occurred during the experiment. The initial concentration of DDT causing 50% mortality in two days was about 0.075 ppm. Osmolality significantly increased after exposure to 25 ppm Aroclor 1221 or 0.075 ppm DDT. Serum Na^+ concentration increased significantly in fish exposed for 6 hr to 0.25 ppm DDT and 24 hr to 75 ppm Aroclor 1221. The findings suggest a decreased ability to osmoregulate.

74-0645. Pritchard, J. B.; Guarino, A. M.; Kinter, W. B. (Mt. Desert Island Biol. Lab., Salisbury Cove, ME). **Metabolism of ^{14}C-DDT by the winter flounder, *Pseudopleuronectes americanus*.** *Bull. Mt. Desert Island Biol. Lab. 11: 81-83; 1971.*

Only small amounts of metabolites of DDT were isolated from tissues and plasma of flounder injected with ^{14}C-DDT. Liver samples taken from 1 hr to 1 wk following administration contained 92 to 95% as pure DDT; 87 to 97% of the radioactive material in the plasma was DDT. Urine, however, contained 5 to 30% as DDT, 40 to 80% as polar metabolites, and 5 to 20% as materials cochromatographing with TDE and DDE. Only 2% of the injected dose was excreted in the urine within one week. The results suggest that flounder retains most of the DDT presented to it, probably in the muscle since it has no major lipid depot, and could be potentially dangerous to terminal consumers.

74-0646. Sokolik, I. Yu. (Dept. Embryol., Inst. Exp. Med. USSR Acad. Med. Sci., Leningrad, USSR). **Vliyaniye 2,4,5-trikhlorfenoksiuksusnoy kisloty i yeye butilovogo efira na embriogenez krys. [The effect of 2,4,5-trichlorophenoxyacetic acid and its butyl ester on rat embryogenesis.]** *Byull. Eksp. Biol. Med. 76(7): 90-92; 1973.* (Russian)

The teratogenic effect of 2,4,5-T and its butyl ester was studied in rats. Pregnant rats were administered single 100 or 400 mg/kg doses of 2,4,5-T and 50 or 200 mg/kg doses of 2,4,5-T butyl ester through gastric tube between the first and 16th day of pregnancy. Both 2,4,5-T and its butyl ester were highly specific teratogens, causing such anomalies as cleft palate, hydronephrosis, brachydactylia, and gastrointestinal hemorrhages in newborn rats. The teratogenic effect of 2,4,5-T butyl ester was more pronounced than that of 2,4,5-T. The teratogenic effect is most probably due to the presence of trace quantities of dioxin in the preparation.

74-0647. Bishun, N. P.; Williams, D. C.; Mills, J.; Lloyd, N.; Raven, R. W.; Parke, D. V. (Res. Dept., Marie Curie Mem. Foundation, The Chart, Oxted, Surrey, England). **Chromosome damage induced by chemicals.** *Chem.-Biol. Interactions 6(6): 375-392; 1973.* (68 references)

Assessment of mutagenic and carcinogenic activity of chemicals which will eventually reach human tissue is difficult since negative results obtained at certain dose levels in experimental animals or culture systems do not necessarily indicate a harmless level. Work with pesticides and other chemicals has demonstrated that point mutations can occur at very low dose levels. Captan has been shown to be highly mutagenic in *E. coli* and teratogenic in the chick embryo. In vitro studies have shown DDT to be mutagenic in human cells and to cause chromosomal damage to cultured mammalian cells. DDT has also been found mutagenic in rats. 2,4-D caused impairment of mitosis in cultures of pea callus and a decrease in the rate of polyploid dividing cells. Chromosomal studies and tests for mutagenic potential should be an integral part of safety evaluations of such materials. Persons occupationally exposed to hazardous chemicals should be monitored continuously for chromosomal abnormalities to try to eliminate chemical mutagens before harmful mutations are revealed in future generations.

74-0648. Palmer, J. S.; Wright, F. C.; Haufler, M. (Toxicol. Res. Lab., Vet. Sci. Res. Div., Agr. Res. Serv., Kerrville, TX). **Toxicologic and residual aspects of an alkyl mercury fungicide to cattle, sheep, and turkeys.** *Clin. Toxicol. 6(3): 425-437; 1973.* (9 references)

Acute toxicity, clinical course, and concentration and distribution of mercury in kidney, liver, muscle, and brain samples were determined in a limited number of cattle, sheep, and turkeys. Dosage levels of a fungicide compound containing 7.7% ethyl mercury *p*-toluene sulfonanilide (granosan) as the active ingredient, equivalent to 3.2% elemental mercury (0.48 mg/kg), were 15 mg/kg of bodyweight for cattle and sheep. Dosages for turkeys were 5 mg of the fungicide/kg or 0.16 mg mercury/kg. Signs of mercurialism were observed in all species with deaths occurring in cattle and sheep. Toxicosis resulted from an average mercury intake of 10 mg/kg/day in cattle, 17.4 mg/kg/day in sheep, and 1.3 mg/kg/day in turkeys, which could result from the daily intake of treated grain in amounts of 3.0 kg, 0.5 kg, and 39 gm, for the respective animals used in these studies. Mercury residues were generally greatest in the kidney and the liver of cattle and sheep. Concentrations were less in the muscle and least in the brain. In turkeys, residues were generally higher in the liver than the kidneys, and lesser amounts were found in the muscle and brain. Minimal amounts of mercury were in the tissues of control animals. (Author abstract by permission)

74-0649. Suschetet, M.; Causeret, J. (Station de Recherches sur la Qualite des Aliments de l'Homme, Inst. Nat. Rech. Agron., Dijon, France). **Effets physiopathologiques et nutritionnels de l'acide amino-4 trichloro-3.5.6 picolinique (piclorame) chez le Rat. [Physiopathologic and nutritional effect of picloram in**

the rat.] *C. R. Acad. Sci. Paris Ser. D 276(11): 1775-1777; 1973.* (4 references) (French)

Young male and female Sprague-Dawley rats were daily fed 100 or 1,000 mg of picloram per kg of body weight for six months. Picloram did not produce any noteworthy modifications in physiological indices such as the nitrogen, phosphorus, or calcium turnover; the urinary elimination of thiamine, riboflavin, and vitamin B6; the red blood cell and hemoglobin levels; and the total nitrogen, total lipid, and phosphorus levels in the liver. Histopathological investigations showed no noticeable differences from the control group. However, 1000 mg/kg doses caused slightly increased mortality, reduced growth rate in females, slight hypertrophy of the liver and kidney in both males and females, slightly increased rate of urinary excretion of creatinine in males, and increased fecal elimination of calcium.

74-0650. Dishovski, Kh.; Kotev, G. (VVMI, Sofia, Bulgaria). **Elektronnomikroskopsko izsledovane na sinaptichnite strukturi na n. caudatus v glaven mozuk na prakh pri eksperimentalno otravyane s dimetildikhlorvinilfosfat i negevoto lechenie s TMB-4. [Electron microscopic examination of synaptic structures of n. caudatus in rat cerebrum during experimental poisoning with dimethyldichlorovinylphosphate and its treatment with TMB-4.]** *Eksp. Med. Morfol. 11(3): 141-145; 1972.* (5 references) (Bulgarian)

The effect of a single, high dose of DDVP (dichlorvos) and of TMB-4 on the synaptic structures of the nucleus caudatus of the rat cerebrum was studied by electron microscopy. The rats were orally administered 140 mg of DDVP (2 X LD50) per kg of body weight. Half of the poisoned animals were given 20 mg of TMB-4 per kg 2 min after poisoning. Drastic changes in the synaptic structures and considerable inhibition of the cholinesterase activity in the cerebrum were observed. Reduction in the number of the synaptic vesicles, homogenization, and destruction of mitochondrial membranes were observed during electron microscopic investigations of the axodendritic synapses of the n. caudatus. The reactivator TMB-4 preserved the structural components of the synapses to a considerable degree.

74-0651. Izmirova, N.; Marinov, V. (Central Sci. Res. Inst. Hyg., Ind. Hyg., Sofia, Bulgaria). **Razpredelenie i otdelyane na ^{35}S-tsiram 24 chasa sled peroralno vuvezhdane na preparata v zhenski plukhove. [Distribution and excretion of ^{35}S-ziram and metabolic products in 24 hours following oral administration of the preparation to female rats.]** *Eksp. Med. Morfol. 11(3): 152-156; 1972.* (7 references) (Bulgarian)

The distribution and elimination of ^{35}S-labeled ziram from female white rats 24 hr after oral administration of 140 mg of ziram and of 0.1 ml chloroform solution of ^{35}S-labeled ziram per kg of body weight was studied by autoradiography. The water-soluble ziram metabolite concentrations in the gastric content, liver, spleen, blood, lung, kidney, urine, feces, ovary, and thyroid gland, expressed in pulse/min/g, were 105, 30, 45, 67.3, 31.2, 17.1, 64.1, 8429, 517, 46, and 161.6 pulses/min/g. The corresponding values obtained for chloroform-soluble metabolites were 557, 3.7, 13.5, 2.02, traces in the lung and heart, 4.9, 53.33, 1543, 15.8, and 26.4 pulses/min/g. The findings indicate that ziram is mainly transformed into highly polar water-soluble metabolites. The quantitative ratios of the water-soluble and chloroform-soluble metabolites in the gastric content, liver, spleen, blood, lung, heart, kidney, thyroid gland, ovary, urine, and feces are 0.188, 8.10, 3.33, 33.21, 3120, 17.10, 13.08, 6.20, 2.91, 158.05, and 0.335.

74-0652. Angelov, A. D. (VVMI, Sofia, Bulgaria). **Prouchvaniya otnosno efekta na tiamina vurkhu nervnomuskulnata provodimost u kotki, tretirani s antikholinesterazni fosfororganichni veshtetstva. [A study on the effect of thiamine on neuromuscular conductivity in cats treated with cholinesterase inhibiting phosphororganic substances.]** *Eksp. Med. Morfol. 11(3): 193-196; 1972.* (28 references) (Bulgarian)

The effect of thiamine and toxogonin on the neuromuscular conductivity of the cat anterior tibial muscle during blockade of the neuromuscular conductivity by irreversible cholinesterase inhibitors (preparations 3 and V, not otherwise identified) was studied in narcotized cats. Thiamine injected in a dose of 5 mg/kg was unable to lift the blockade caused by 200 g/kg of preparation 3 or by 150 mg/kg of preparation V, while repeated 20 mg/kg or single 30 mg/kg doses of thiamine lifted the neuromuscular blockade. The organophosphorus substances, when administered after the introduction of thiamine, failed to induce neuromuscular blockade, which indicates the good prophylactic effect of thiamine. Potentiating effect of thiamine and toxogonin was determined. The effect of thiamine on the neuromuscular blockade induced by organophosphorus cholinesterase inhibitors is most probably due to its antidepolarization property.

74-0653. Izmirova, N. (Central Sci. Res. Inst. Hyg., Ind. Hyg., Sofia, Bulgaria). **Izsledvane na raztvorimite vuv voda i khloroform metaboliti na ^{35}S-tsiram posredstvom khartiena tonkosloyna khromatografiya. [A study of the water-soluble and chloroform-soluble metabolites of ^{35}S-ziram by means of paper chromatography.]** *Eksp. Med. Morfol. 11(4): 240-243; 1972.* (3 references) (Bulgarian)

The metabolization and distribution of ^{35}S-labeled ziram in white rats was studied by paper chromatography. The animals were fed single 100 mg/kg/doses of ziram and of ^{35}S-labeled ziram corresponding to 0.1 μCi/kg of body weight. The metabolites were analyzed in different organs 24 hr after poisoning. Ziram was

rapidly metabolized following oral administration. Six different sulfur-containing, chloroform-soluble metabolites, including 10% of non-metabolized ziram, were detected in the gastric content. In the feces, 57% of all sulfur-containing, chloroform-soluble compounds were present in the form of non-metabolized ziram. Five different water-soluble metabolites were found in the urine. The respective proportions of the three main metabolites with *Rf* values of 0.33, 0.44, and 0.53 were 74.34%, 10.72%, and 7.04%. The metabolites with the *Rf* values 0.33, 0.44, and 0.53 were found in all samples of gastric content, liver, spleen, blood, lung, heart, ovary, thyroid gland, kidney, urine, and feces. Their contents were highest in the liver, kidney, ovary, and thyroid gland and lowest in the urine.

74-0654. Neubert, D.; Zens, P.; Rothenwallner, A.; Merker, H. J. (Pharmakol. Inst. Freien Univ. Berlin, Sonderforschungsbereich 29, Berlin, Germany). **A survey of the embryotoxic effects of TCDD in mammalian species.** *Environ. Health Perspect. 5: 67-69; 1973.* (22 references)

Data available on the embryotoxic effects of TCDD (2,3,7,8-tetrachlorodibenzo-*p*-dioxin) in rats and mice has been evaluated. Repeated doses of from 1 to 10 μg/kg have been found teratogenic, making TCDD the most effective teratogen known. Cleft palate and kidney abnormalities are the only types of malformation reported for this compound, but other abnormalities such as intestinal hemorrhage and fatty infiltration of the liver have been observed. It is expected that more will be found on further examination. Fetal mortality may or may not follow incidence of teratogenic effects depending on species or schedule of dosage. The highest incidence of malformations in mice was produced when the drug was given on day 11 of pregnancy and the dose response curve was intermediate in steepness between those of a number of known teratogenic agents. From combination experiments it was concluded that a potentiation can be expected with doses of TCDD as low as 1/20 of the threshold when other agents producing the same effects are administered.

74-0655. Moore, J. A.; Gupta, B. N.; Zinkl, J. G.; Vos, J. G. (Nat. Inst. Environ. Health Sci., N.I.H., P. O. Box 12233, Research Triangle Park, NC 27709). **Postnatal effects of maternal exposure to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD).** *Environ. Health Perspect. 5: 81-85; 1973.* (2 references)

Maternal treatment of mice with TCDD at 3 μg/kg on days 10 to 13 of gestation produced a 55.4% incidence of cleft palate and an incidence of kidney anomalies of 95.1% in pups. A renal papilla markedly reduced in size or nonexistent characterized the kidney anomaly, and a significantly high occurrence in the right kidney was observed. A progressive hydronephrosis was produced in pups born of untreated mothers which were given TCDD during the nursing period, and the right kidney was again the most affected. Thymus effects have also been recorded, but more definitive experiments are needed in this area.

74-0656. Schwetz, B. A.; Norris, J. M.; Sparschu, G. L.; Rowe, V. K.; Gehring, P. J.; Emerson, J. L.; Gerbig, C. G. (Chem. Biol. Res., Dow Chem. Co., Midland, MI 48640). **Toxicology of chlorinated dibenzo-*p*-dioxins.** *Environ. Health Perspect. 5: 87-99; 1973.* (17 references)

Oral LD50s for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) ranged from 0.006 mg/kg in male guinea pigs to 0.115 mg/kg in rabbits. Lethality was about the same in rabbits for intraperitoneal, oral, or dermal administration. In a small number of animals tested, 2,7-DCDD, OCDD and HCDD in doses of at least 1 μg/kg did not cause death. Delayed conjunctival chemosis but not corneal injury or iritis was observed in rabbit eyes treated with TCDD. Acne was produced in the rabbit ear bioassay by benzene solutions of TCDD, but not chloroform solutions of similar concentrations. Fetal abnormalities were not induced by maternal administration of 2,7-DCDD or OCDD in rats, but HCDD was highly lethal to fetuses during late gestation. Chick edema was produced by 1 and 10 μg/kg/day TCDD or 10 and 100 μg/kg/day HCDD.

74-0657. Harris, M. W.; Moore, J. A.; Vos, J. G.; Gupta, B. N. (Nat. Inst. Environ. Health Sci., N.I.H., P.O. Box 12233, Research Triangle Park, NC 27709). **General biological effects of TCDD in laboratory animals.** *Environ. Health Perspect. 5: 101-109; 1973.* (9 references)

TCDD (dioxin) reduced weight gain in rats during the week after dosing at levels of 25 μg/kg or greater. Mortality was observed at 50 μg/kg in females and 100 μg/kg in males. Clinical symptoms seen at 100 μg/kg included ruffled hair coat, hunched posture, inactivity, and jaundice; death occurred between days 14 and 21. A daily dose of 10 μg/kg TCDD for 31 days resulted in weight loss and the death of 15 out of 16 rats. Nine out of 10 guinea pigs suffered severe weight loss and died within a mean of 19.2 days after a single 3 μg/kg dose. Mice were not susceptible to single oral doses up to 50 μg/kg, but weekly doses of 25 μg/kg caused significant weight loss. TCDD at 25 μg/kg reduced thymus weights in rats. Marked thymic atrophy was seen in guinea pigs at the time of necropsy.

74-0658. Zinkl, J. G.; Vos, J. G.; Moore, J. A.; Gupta, B. N. (Nat. Inst. Environ. Health Sci., N.I.H., P.O. Box 12233, Research Triangle Park, NC 27709). **Hematologic and clinical chemistry effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in laboratory animals.** *Environ. Health Perspect. 5: 111-118; 1973.* (19 references)

TCDD (2,3,7,8-tetrachlorodibenzo-*p*-dioxin) increased SGPT, SGOT, serum cholesterol, and serum bilirubin in rats given 10 μg/kg. All doses decreased blood glucose concentration with time and depressed platelet count on at least one day. Leucocyte and lymphocyte counts were significantly but reversibly decreased in mice given a single oral dose of TCDD at 1.0, 10.0, or 50.0 μg/kg. TCDD given to tetanus toxoid-injected guinea pigs depressed lymphocytes. Both leucocyte and lymphocyte counts showed a dose related decrease in TCDD-treated guinea pigs. Terminal hemoconcentration was observed in treated rats and guinea pigs.

74-0659. Weissberg, J. B.; Zinkl, J. G. (Nat. Inst. Environ. Health Sci., N.I.H., P.O. Box 12233, Research Triangle Park, NC 27709). **Effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin upon hemostasis and hematologic function in the rat.** *Environ. Health Perspect. 5: 119-123; 1973.* (15 references)

Packed cell volumes and erythrocyte counts in rats given a daily oral dose of 10 μg/kg 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) were higher than those in controls at days 10 and 14. A depression in mean corpuscular volume and mean corpuscular hemoglobin was observed at day 10 but not at day 14. A significant elevation in neutrophil counts was found on both days, and elevated leucocytes, monocytes, and lymphocytes were also seen. Platelet counts were significantly lower in treated rats at days 10 and 14, as was clot retraction. Markedly prolonged prothrombin consumption times, both with and without Inositihin, were produced although prothrombin times were unaltered.

74-0660. Gupta, B. N.; Vos, J. G.; Moore, J. A.; Zinkl, J. G.; Bullock, B. C. (Nat. Inst. Environ. Health Sci., N.I.H.; P.O. Box 12233, Research Triangle Park, NC 27709). **Pathologic effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in laboratory animals.** *Environ. Health Perspect. 5: 125-140; 1973.* (11 references)

Thymic atrophy and liver damage were the two pathologic changes observed in rats, mice, and guinea pigs given various doses of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). Guinea pigs were the most susceptible to the drug, experiencing 100% mortality after a single dose of 3 μg/kg and showing other pathologic changes including hemorrhage, atrophy of adrenal zona glomerulosa, and depletion of lymphoid organs. Depletion of cortical thymocytes in the thymus and of lymphoid cells in spleen and lymph nodes was observed on histopathologic examination. Degenerative changes in the liver were found in all species, but were most severe in the rat. Transient degenerative changes in the liver were followed by megalocytosis, regeneration, and unusual numbers of multinucleated giant hepatocytes at sublethal doses. Epithelial cells of renal connecting and collecting tubules and thyroid follicles were also affected.

74-0661. Fowler, B. A.; Lucier, G. W.; Brown, H. W.; McDaniel, O. S. (Nat. Inst. Environ. Health Sci., N.I.H., P.O. Box 12233, Research Triangle Park, NC 27709). **Ultrastructural changes in rat liver cells following a single oral dose of TCDD.** *Environ. Health Perspect. 5: 141-148; 1973.* (14 references)

Single doses of 5 or 25 μg/kg 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) profoundly influenced both the smooth and rough endoplasmic reticulum of rat liver parenchymal cells. The changes were probably related to an induction phenomenon and changes in cellular RNA and protein metabolism. The increase in SER was closely correlated with the induction of microsomal enzyme activity in the same animals. Maximum proliferation of RER occurred on day 6 and was correlated with increased RER as determined by microsomal subfractionation. The membranous concentric whorls of endoplasmic reticulum observed in other studies were not noted after these single doses.

74-0662. Vos, J. G.; Moore, J. A.; Zinkl, J. G. (Nat. Inst. Environ. Health Sci., N.I.H., P.O. Box 12233, Research Triangle Park, NC 27709). **Effect of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin on the immune system of laboratory animals.** *Environ. Health Perspect. 5: 149-162; 1973.* (17 references)

Guinea pigs were dosed weekly for eight weeks with up to 0.2 μg/kg TCDD. Surviving animals were vaccinated with killed *M. tuberculosis* and tested for cell-mediated immunity. Skin reactions after tuberculination were significantly reduced at the 0.04 and 0.2 μg/kg doses. Indirect immunosuppression by stimulation of adrenocortical activity was eliminated. Serum tetanus antitoxin concentrations were slightly depressed in the 0.2 μg/kg group at days 49 and 56 in animals injected with tetanus toxoid at days 28 and 42. No effect was found in skin tests on rats after administration of up to 5.0 μg/k. During the graft versus host assay in mice, cell mediated immunity was suppressed in the case of spleen cells from the 5 μg/kg donor group.

74-0663. King, M. E.; Shefner, A. M.; Bates, R. R. (Life Sci. Res. Div., IIT Res. Inst., Chicago, IL 60616). **Carcinogenesis bioassay of chlorinated dibenzodioxins and related chemicals.** *Environ. Health Perspect. 5: 163-170; 1973.* (10 references)

Preliminary results from a continuing skin carcinogenesis study have been obtained on relatively non-toxic dioxins. Skin tumors have not been found on backs of mice exposed 3 times a week for 60 wk to solutions of 0.2, 3.0, and 80 mg/ml octachloro-, dichloro-, and unsubstituted dibenzodioxin in acetone. Subcutaneous tumors were found in two mice exposed to octachlorodibenzodioxin. A malignant lymphoma of the lymphocyte type was found in a mouse treated with unsubstituted dioxin. Male mice have had apparent skin tumors when treated with unsubstituted or dichloro-

dibenzodioxin in promotion studies, probably because males suffer skin wounds during fighting while females are less inclined to fight.

74-0664. Johnson, R. L.; Gehring, P. J.; Kociba, R. J.; Schwetz, B. A. (Designed Products Dept., Dow Chem. Co., Midland, MI 48640). **Chlorinated dibenzodioxins and pentachlorophenol.** *Environ. Health Perspect. 5: 171-175; 1973.* (5 references)

The toxicology of commercial, pure, and "improved" pentachlorophenol was compared using the rabbit ear bioassay, the chick edema bioassay, and 90-day feeding studies in rats. The commercial preparation, containing 0 ppm 2,3,7,8-tetrachlorodibenzo-*p*-dioxin, 9-27 ppm hexachlorodibenzo-*p*-dioxins, and 575-2510 ppm octachlorodibenzo-*p*-dioxin, was positive in the rabbit ear and chick edema assays. A depression of erythrocytes, hemoglobin, and packed cell volume and degeneration and necrosis of the liver were observed at 30 mg/kg during feeding studies. At even lower doses serum alkaline phosphatase was elevated and serum albumin depressed; weights of kidneys and livers increased. Chemically pure and "improved" pentachlorophenols were negative in the chick edema and rabbit ear assays and produced only increased liver and kidney weights in the feeding studies. The "improved" preparation contained only 26 ppm octachlorodibenzo-*p*-dioxin and 1 ppm hexachlorodibenzo-*p*-dioxin. An application for its use has been approved by the Environmental Protection Agency.

74-0665. Miller, R. A.; Norris, L. A.; Hawkes, C. L. (Dept. Fish. Wildlife, Oregon State Univ., Corvallis, OR 97331). **Toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) in aquatic organisms.** *Environ. Health Perspect. 5: 177-186; 1973.* (12 references)

The toxicity of 2,3,7,8-tetrachlordibenzo-*p*-dioxin (TCDD) was examined in three species of fish (guppies, coho or silver salmon, and rainbow trout) and three aquatic invertebrates (a snail, a worm, and mosquito larvae). Reduced feeding was observed eight days after exposure in salmon and five days after exposure in guppies. These two fish lost the caudal fin and accumulated large areas of fungal growth where skin discoloration occurred. Exposure to TCDD at 54 ng/g for 24 hr resulted in 100% mortality in coho salmon within 40 days. Level of exposure was a more significant factor in mortality than duration of exposure. Smaller fish were more susceptible than larger fish. Feeding TCDD with the food at 6.3 μg TCDD/tank/wk for 4 weeks markedly reduced growth of young rainbow trout. TCDD exposure at 0.2 ppb did not affect pupation of mosquito larvae, but this concentration reduced the reproductive success of a pulmonate snail and an Oligochaete worm.

74-0666. Zitko, V.; Wildish, D. J.; Hutzinger, O.; Choi, P. M. K. (Environ. Canada, Fish. Res. Board, Biol. Station, St. Andrews, N. Brunswick, Canada). **Acute and chronic oral toxicity of chlorinated dibenzofurans to salmonid fishes.** *Environ. Health Perspect. 5: 187-189; 1973.* (5 references)

Mortality was not observed among immature brook trout given doses up to 122 mg/kg of 2,8-dichlorodibenzofuran at different times in gelatin capsules. Tissue levels of the material were very low, ranging from 0.01 to 0.13% of the dose in muscle and 0.08 to 0.4% in liver. The relative concentration of the tri- and tetrachlorodibenzofuran was higher in tissue than in an administered preparation of crystalline material containing a 1:0.92:0.18 ratio of 2,8-dichlorodibenzofuran, tri- and tetrachlorodibenzofurans.

74-0667. Lucier, G. W.; McDaniel, O. S.; Hook, G. E. R.; Fowler, B. A.; Sonawane, B. R.; Faeder, E. (Nat. Inst. Environ. Health Sci., N.I.H., P.O. Box 12233, Research Triangle Park, NC 27709). **TCDD-induced changes in rat liver microsomal enzymes.** *Environ. Health Perspect. 5: 199-209; 1973.* (38 references)

TCDD (2,3,7,8,-tetrachlorodibenzo-*p*-dioxin), at sublethal levels, significantly elevated a number of microsomal enzyme activities including aniline hydroxylation and, particularly, UDP glucuronyltransferase activity and decreased aminopyrine demethylation. Cytochrome P-450 and b_5 were both elevated by day 3, but levels of these and the enzymes tested generally returned to normal by day 25. TCDD treatment did not affect microsomal protein, and there was no indication of liver damage. Females appeared to be more susceptible to the changes in microsomal enzyme activity than males. A single oral dose of 0.2 μg/kg TCDD induced benzpyrene hydroxylation 683% and glucuronyltransferase 157% in females. TCDD markedly decreased SER to RER ratios for all parameters tested.

74-0668. Greig, J. B.; De Matteis, F. (MRC Toxicol. Unit, Med. Res. Council Lab., Woodmansterne Rd., Carshalton, Surrey, England). **Effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin on drug metabolism and hepatic microsomes of rats and mice.** *Environ. Health Perspect. 5: 211-219; 1973.* (29 references)

Oral administration of dioxin at 200 μg/kg in rats reduced the duration of zoxazolamine paralysis and prolonged hexabarbitone sleeping time. The divergent effects of dioxin on the activity of these drugs was a consequence of changes in their metabolism. Effects of differences in absorption or distribution of the barbiturate or alteration of the sensitivity of the nervous system were ruled out. Liver microsomes obtained three days after dioxin treatment metabolized zoxazolamine more rapidly and hexabarbitone more slowly than those from controls. Liver weight and cytochrome content significantly increased in treated animals although microsomal protein did not. A shift occurred in the peak

maximum of cytochrome and resembled that caused by methylcholanthrene. Difference spectra obtained on the interaction of hexabarbitone with microsomes from control animals were unlike those obtained from dioxin-treated animals. Experiments with mice indicated that a stimulation of zoxazolamine metabolism could be observed without any inhibition of hexabarbitone metabolism.

74-0669. Woods, J. S. (Pathol. Physiol. Branch, Nat. Inst. Environ. Health Sci., N.I.H., P.O. Box 12233, Research Triangle Park, NC 27709). **Studies of the effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin on mammalian hepatic δ-aminolevulinic acid synthetase.** *Environ. Health Perspect. 5: 221-225; 1973.* (22 references)

TCDD(2,3,7,8-tetrachlorodibenzo-*p*-dioxin), at doses of 5 or 25 μg/kg, did not significantly alter the activity of δ-aminolaevulinate (ALA) synthase in rats during the 28-day observation period. Animals receiving up to a single dose of allylisopropylacetamide (AIA), a known inducer of ALA synthase, exhibited a 7-fold increase in this parameter. TCDD did not affect the induction of ALA synthase by AIA nor alter the subcellular distribution of the enzyme. In fetal rats from TCDD-treated mothers or in newborn rats given the drug, no changes were observed in ALA synthase activity. These results suggest that significant differences exist between species in regulation of hepatic heme synthesis and porphyrin metabolism since TCDD produced a potent induction of ALA synthase in chick embryos.

74-0670. Hwang, S. W. (Pharmacol. Toxicol. Branch, Nat. Inst. Environ. Health Sci., N.I.H., P.O. Box 12233, Research Triangle Park, NC 27709). **Effect of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin on the biliary excretion of indocyanine green in rat.** *Environ. Health Perspect. 5: 227-231; 1973.* (6 references)

Bile flow was significantly higher in rats treated with 5 or 25 μg/kg TCDD(2,3,7,8-tetrachlorodibenzo-*p*-dioxin) than in controls. TCDD also increased liver weight and decreased excretion of ICG, a dye used as an index of biliary function. This decrease was dose related and lasted until the 16th day after treatment. ICG concentrations were lower in the bile and higher in plasma when animals were treated with TCDD than when they were not. The rate of disappearance of ICG in plasma was depressed by treatment.

74-0671. Norback, D. H.; Allen, J. R. (Dept. Pathol., Univ. Wisconsin Med. School, Univ. Wisconsin, Madison, WI 53706). **Biological responses of the nonhuman primate, chicken, and rat to chlorinated dibenzo-*p*-dioxin ingestion.** *Environ. Health Perspect. 5: 233-240; 1973.* (10 references)

Experimental studies have shown that administration of crude industrial fat containing chlorinated dibenzo-*p*-dioxins (primarily the tetrachlorinated compound) causes varying responses in the chicken, the rat, and the monkey. Extreme morbidity and mortality were observed in chickens with concentrations causing only mild toxicity to rats. Monkeys were intermediate in response. Ascites, hydrothorax, hydropericardium, and anasarca developed in the chicken and monkey, but not in the rat, and these changes were probably partially the result of hepatic degenerative changes and altered permeability. Only the monkey exhibited gastric hyperplasia and ulceration with skin alterations such as alopecia, hyperkeratosis, follicular keratin cysts, and hyperplasia of the epithelium of the hair follicles. All species had hypoplasia of the lymph tissue and bone marrow and enlarged livers. Hypoactivity of the seminiferous tubules of the testes was observed in monkeys and chickens. Studies with radioactive chlorodibenzo-*p*-dioxins demonstrated that the proliferated hepatic endoplasmic reticulum induced in animals exposed to the compound may function as an area of localization as well as increased metabolism of these toxic dioxins.

74-0672. Piper, W. N.; Rose, J. Q.; Gehring, P. J. (Oakdale Toxicol. Cent., Dept. Pharmacol., Univ. Iowa, Iowa City, IA 52240). **Excretion and tissue distribution of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in the rat.** *Environ. Health Perspect. 5: 241-244; 1973.* (5 references)

A total of 53.2% of a 50 μg/kg dose of labeled 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) was excreted in the feces of rats over a 21-day period, 30% being excreted in the first 48 hr. A total of 13.2% was recovered from the urine and expired CO_2. After the first two days the disappearance of ^{14}C activity from the body followed apparent first-order rate kinetics, and the half-life was 17.4 days. Liver and fat contained most of the tissue radioactivity, and small amounts of ^{14}C were found in muscle, testes, lungs, heart, skin, spleen, stomach, pancreas, brain, bone, kidneys, and adrenals.

74-0673. Poland, A.; Glover, E. (Dept. Pharmacol. Toxicol., Univ. Rochester School Med. Dentistry, Rochester, NY 14642). **Studies on the mechanism of toxicity of the chlorinated dibenzo-*p*-dioxins.** *Environ. Health Perspect. 5: 245-251; 1973.* (13 references)

TCDD (2,3,7,8-tetrachlorodibenzo-*p*-dioxin) injected into the egg produced a dose-dependent increase in the activity of chick embryo liver δ-aminolaevulinate (ALA) synthase, the initial and rate limiting enzyme in the heme biosynthesis pathway. A doubling of enzyme activity resulted from introduction of as little as 4.66×10^{-12} mole/egg or 1.5 ng. The effect of TCDD on porphyrin synthesis was much greater and of longer duration than that of other porphyrigenic chemicals. In a series of 15 halogenated dibenzo-*p*-dioxins only those which had halogen atoms occupying at least three of the

four lateral ring positions and at least one free, nonhalogenated carbon atom were inducers of ALA synthase. Limited data suggests that the structure-activity relationship is the same for the dibenzofurans. Nearly a 2-fold increase in the activity of aryl hydrocarbon hydroxylase in chick embryo liver was produced at a dose of 0.5 mg/egg. Maximum induction of this enzyme was reached in 18 hr. The elevation persisted for at least 5 days. Other halogenated dioxins which induced ALA synthase also stimulated aryl hydrocarbon hydroxylase activity. TCDD at a dose of 3.11×10^{-10} mole/kg produced nearly a 5-fold increase in this enzyme in the rat.

74-0674. Matsumura, F.; Benezet, H. J. (Dept. Entomol., Univ. Wisconsin, Madison, WI 53706). **Studies on the bioaccumulation and microbial degradation of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *Environ. Health Perspect. 5: 253-258; 1973.* (9 references)

TCDD (2,3,7,8-tetrachlorodibenzo-*p*-dioxin), DDT, lindane (γ-BHC) and Zectran (mexacarbate) were tested in several model systems to determine their relative persistence and bioaccumulation. Vertical translocation of pesticides from sand to organic soil was least with TCDD (10%), moderate with DDT (35%), and greatest with Zectran (> 99%). Only 5 of 100 strains of microorganisms screened were able to degrade TCDD at all. Sand containing a deposit of pesticide was introduced into an aquarium containing invertebrates and/or fish. Shrimp and fish accumulated TCDD in extremely small amounts while mosquito larvae showed a surprisingly high rate of pick up. Uptake through ingestion of larvae was responsible for a considerable degree of concentration of TCDD, but not the other pesticides, in fish.

74-0675. Shea, K. P. (Author address not given). **Block that drug.** *Environment 15(10): 25-30; 1973.* (19 references)

With 2,4,5-T, silvex, and many other substances which have caused teratogenic effects or other health hazards the public must decide how many may be released into the environment. Generally, testing can only be done in laboratory animals, making evaluation of human sensitivity difficult, and common effects observed in the general population such as cleft palate, which is produced in animals by 2,4,5-T, cannot be attributed to a single factor. A number of interactions have been observed with combinations of pesticides, pesticides plus protein deficiency or genetic deficiencies, and pesticides plus environmental chemicals in laboratory studies. As in the case of 2,4,5-T, the question of a no-effect level is not readily resolved, and decisions are often based on a benefit-risk ratio.

74-0676. Meeter, E. (Med. Biol. Lab. TNO, Rijswijk (ZH), The Netherlands). **Investigation of the rapid recovery of rat thermoregulation from soman poisoning.** *Eur. J. Pharmacol. 24(1): 105-107; 1973.* (12 references)

Soman injection (5μg) in the right lateral ventricle (i.c.v.) in rats induced a downward shift in the set-point for heat release of about 3.4°. The response of the set-point for heat release to a test dose of carbachol (2μg) was approximately the same before and 4 hr following soman administration when the soman effect had almost disappeared. This finding indicates that the recovery of the thermostat from soman treatment was not a result of decreased sensitivity of the cholinergic synapses involved. It has been previously reported that recovery of AChE could be rapid enough to account for the recovery of thermoregulation from the effects of soman.

74-0677. Kamel, S. H.; El-Guindi, M. M.; Shaban, F. E. (Fac. Vet. Med., Cairo Univ., Cairo, Egypt). **Toxicological studies of phosvel (V.C.S.) in mammals.** *Eur. J. Toxicol. 6(2): 70-80; 1973.* (48 references)

The oral 72-hr LD50 for phosvel (leptophos) in rabbits was 124.2 mg/kg. This dose significantly inhibited pseudocholinesterase for the duration of the experiment and at many times elevated serum SGOT. Symptoms of poisoning appeared within 3 hr of administration and were typical of parasympathetic stimulation, muscarinic and nicotinic effects, and C.N.S. effects. Abortion occurred in one pregnant animal, and dead fetuses were found in the uterus of other pregnant animals. Survivors of the LD50 dose showed only rapid and deep respiration and sometimes wheezing. The lungs were the only organ to show pathological changes.

74-0678. Balogh, K.; Merk, F. B. (Dept. Pathol., Univ. Hosp., 750 Harrison Ave., Boston, MA 02118). **Ultrastructure of renal collecting tubules following ingestion of a bipyridinium herbicide (morfamquat).** *Experientia 29(9): 1101-1103; 1973.* (6 references)

Significant ultrastructural changes were not observed in parotid gland, thyroid, or liver samples taken from rats fed morfamquat dichloride (0.015% wet weight in the diet) for 6, 12, or 24 wk. Kidney collecting ducts showed an increase in lysosomal bodies in the epithelial cells and considerable quantities of cellular debris within the lumina. Mitochondria were the same in size, number, and structure in kidneys from control and treated animals.

74-0679. Borisenko, N. F. (Dept. Occup. Hyg. Occup. Dis., Kiev Med. Inst., Kiev, USSR). **O mekhanizme povrezhdayushchego deystviya organicheskikh soyedineniy rtuti. [Mechanism underlying the damaging action of organic mercury compounds.]** *Farmakol. Toksikol. 35(4): 484-486; 1972.* (9 references) (Russian)

The mechanism of the acute and chronic toxic effects of radosan (methoxyethylmercury acetate),

granosan (ethylmercury chloride), and agronal (phenylmercury bromide) on albino rats was studied with special regard to the sulfhydryl and thiol groups. The animals were administered single 80 mg/kg doses of radosan, 50 mg/kg doses of granosan, and 110 mg/kg doses of agronal, as well as daily 2.2 mg/kg doses of these preparations for 60 days in the chronic experiment. Animals treated with 50 mg/kg of granosan, 80 mg/kg of radosan, and 110 mg/kg of agronal had reduced free sulfhydryl group levels in the blood proteins on the first, second, and third days of the experiment. Prolonged administration of 2.2 mg/kg doses of these preparations first increased and then decreased the thiol group levels in the blood proteins. The inactivation of the sulfhydryl groups was most pronounced due to radosan and granosan. Thiol group levels were reduced in the blood serum and heart and lung tissues of animals treated with mercury at 2.2 mg/kg for 60 days. The observations indicate the possible denaturation of proteins by organic mercury compounds.

74-0680. Thiele, O. W. (Author address not given). **Wechselwirkung zwischen DDT und essentiellen Fettsaeuren. [Interaction between DDT and essential fatty acids.]** *Hippokrates 44: 95; 1973.* (4 references) (German)

Studies on the interaction between DDT and dieldrin and essential fatty acids, performed on rats, are reviewed. Rats daily fed 30 to 150 ppm DDT or dieldrin in a diet containing no essential fatty acids had a reduced rate of weight gain. Administration of DDT or dieldrin for 12 weeks caused changes of the hepatic fatty acid pattern, proliferation of the endoplasmatic reticulum of the liver cells, activation of their microsomal enzymes, and an increase in the quotient of the arachidonic acid to the eicosa-5,8,11-trienic acid in the hepatic lipids. Dieldrin and DDT are assumed to increase the need of the liver for essential fatty acids. Damages due to DDT are possible in babies and young children due to the small reserves of essential fatty acids.

74-0681. Abou Akkada, A. R.; Hassan, M. A.; Naga, M. A. (Dept. Anim. Production, Fac. Agr., Univ. Alexandria, Alexandria, Egypt). **Effect of some pesticides and herbicides on the rumen micro-organisms of sheep.** *J. Agr. Sci. 81(2): 231-236; 1973.* (18 references)

From 25 to 50 ppm 2,4-D or M_{15} [$(CCl_3\ COO)_3$ Fe, 5%; 1-*S*-butylisothiouronium trichloroacetate, 5%; calcium nitrate, 10%; calcium carbonate, 10%; $(CCl_3\ COO)_2$ Ca, 70%] stimulated the in vitro digestion of cellulose by rumen contents; concentrations above 50 ppm inhibited the hydrolysis. Cotoran (fluometuron) stimulated the digestion of the berseem hay at each of the five concentrations tested. Most of the concentrations of dalapon and DDT inhibited it. Volatile fatty acid production was generally affected most by the herbicides during the first 8 hr of incubation. Dalapon, 2,4-D, and fluometuron had little effect; M_{15} enhanced and DDT inhibited volatile fatty acid levels. The activity of rumen ciliate protozoa, as judged by volatile fatty acid production, was stimulated by all the herbicides. It is possible that these microorganisms are responsible for most of the degradation of the pesticides.

74-0682. Kawatski, J. A.; Schmulbach, J. C. (Dept. Biol. Univ. S. Dakota, Vermillion, SD 57069). **Uptake and elimination of ^{14}C-aldrin and ^{14}C-dieldrin by the ostracod *Chlamydotheca arcuata* (Sars).** *Int. J. Environ. Anal. Chem. 1: 283-291; 1972.* (8 references)

The ostracod *Chlamydotheca arcuata* accumulated aldrin about twice as rapidly as dieldrin during the first 24 hr of exposure to concentrations around the 24-hr EC_{50} for immobility (6.6 and 8.4 ppb, respectively). After 48 hr, however, levels of aldrin and dieldrin were essentially the same. At 96 hr aldrin was concentrated in the tissues 7600 times over the water concentration; dieldrin was concentrated 2300 times. Aldrin was converted to dieldrin in living ostracods, but dieldrin remained unchanged. Uptake of the two compounds was much lower in dead animals than in live ones.

74-0683. Lamoureux, G. L.; Stafford, L. E.; Shimabukuro, R. H.; Zaylskie, R. G. (Agr. Res. Serv., Metab. Radiat. Res. Lab., Fargo, ND 58102). **Atrazine metabolism in sorghum: catabolism of the glutathione conjugate of atrazine.** *J. Agr. Food Chem. 21(6): 1020-1028; 1973.* (35 references)

The major pathway of atrazine metabolism in intact sorghum was shown to involve the following steps: atrazine → *S*-(4-ethylamino-6-isopropylamino-*s*-triazinyl-2)glutathione (III) → γ-glutamyl-*S*-(4-ethylamino-6-isopropylamino-*s*-isopropylamino-*s*-triazinyl-2) cysteine (IV) → *S*-(4-ethylamino-6-isopropylamino-*s*-triazinyl-2)cysteine (V) → *N*-(4-ethylamino-6-isopropylamino-*s*-triazinyl-2)cysteine (VI) → *N*-(4-ethylamino-6-isopropylamino-*s*-triazinyl-2)lanthionine (VII). From 40 to 87% of the atrazine entering sorghum through the roots was estimated to be metabolized via this pathway. Evidence indicated that atrazine can also be metabolized via this route after first undergoing *N*-dealkylation. The conversion of V to VI was shown to be a nonenzymatic rearrangement. This is the first reported occurrence of V, VII, 2-hydroxy-4-amino-6-isopropylamino-*s*-triazine (VIII), and 2-hydroxy-4,6-diamino-*s*-triazine (ammeline, XII) in sorghum. (Author abstract reprinted by permission of the American Chemical Society)

74-0684. Shimabukuro, R. H.; Walsh, W. C.; Lamoureux, G. L.; Stafford, L. E. (Agr. Res. Serv., Metab. Radiat. Res. Lab., State Univ. Sta., Fargo, ND 58102). **Atrazine metabolism of sorghum: chloroform-soluble intermediates in the *N*-dealkylation and glutathione con-**

jugation pathways. *J. Agr. Food Chem. 21(6): 1031-1034; 1973.* (19 references)

Two unrelated metabolites of atrazine were isolated from sorghum. Complete *N*-dealkylation yielded 2-chloro-4,6-diamino-*s*-triazine, which no longer inhibited the Hill reaction and cyclic and noncyclic photophosphorylation in isolated pea chloroplasts. The isolation and identification of the metabolite *N,N'*-bis(4-ethylamino-6-isopropylamino-*s*-triazinyl-2)cystine gave further support to a previous report that atrazine was metabolized by the glutathione conjugation pathway to its lanthionine conjugate. The isolation of the dimer does not necessarily indicate that this is the form of the metabolite in plants. The *N*-cysteine monomer may dimerize in vivo during the sequence of reactions leading to the lanthionine conjugate. (Author abstract reprinted by permission of the American Chemical Society)

74-0685. Cheng, H. M.; Casida, J. E. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Metabolites and photoproducts of 3-(2-butyl)phenyl *N*-methylcarbamate and *N*-benzenesulfenyl-*N*-methylcarbamate.** *J. Agr. Food Chem. 21(6): 1037-1047; 1973.* (26 references)

The insecticide chemical, 3-(2-butyl)phenyl *N*-benzenesulfenyl-*N*-methylcarbamate (BPBSMC), is metabolized in orally treated rats to give 72% of the dose as the following urinary metabolites: eight carbamates from cleavage of the benzenesulfenyl group plus hydroxylation or oxidation of any one of the butyl carbons or the *N*-methyl group; the eight corresponding phenols in free or conjugated form. 3-(2-Butyl)phenyl *N*-methylcarbamate (BPMC) yields the same eight carbamate metabolites in the urine of treated rats. Photoalteration of BPBSMC involves oxidation at the sulfur, *N*-methyl, and butyl moieties, and cleavage of the N–S bond and carbamate ester group. Procedures are given for radiosynthesis of BPMC and BPBSMC and for synthesis of many of the metabolites and photoproducts. The biological activity of these derivatives and the liver microsomal metabolism and possible mechanisms for the selective toxicity of BPBSMC relative to BPMC are discussed. (Author abstract reprinted by permission of the American Chemical Society)

74-0686. Cardona, R. A.; Dorough, H. W. (Div. Cancer Res., Michael Reese Hospital and Medical Center, Chicago, IL). **Syntheses of the β-D-glucosides of 4- and 5-hydroxy-1-naphthyl *N*-methylcarbamate.** *J. Agr. Food Chem. 21(6): 1065-1071; 1973.* (18 references)

4- and 5-(*N*-Methylcarbamoyloxy)-naphthyl tetra-*O*-acetyl-β-D-glucopyranoside were synthesized by the condensation of the appropriate hydroxy-1-naphthyl *N*-methylcarbamate with β-D(+)-glucose pentaacetate in the presence of catalytic amounts of boron trifluoride-ether complex. Reaction of the acetylated β-D-glucosides with barium methoxide in methanol gave the corresponding β-D-glucosides. The ir, nmr, and mass spectra of the β-D-glucosides and their acetylated analogs are reported and compared. When administered i.p. to mice, 4-hydroxyl-1-naphthyl *N*-methylcarbamate was 28 times more toxic than its β-D-glucoside, and 5-hydroxy-1-naphthyl *N*-methylcarbamate was 19 times more toxic than its β-D-glucoside. The methyl ester of the β-D-glucuronide of 5-hydroxy-1-naphthyl *N*-methylcarbamate was prepared in a manner similar to the glucosides. However, attempts to demethylate the product while leaving the carbamate ester intact were unsuccessful. Attempts to synthesize the glucoside of the 3-hydroxy derivative of carbofuran also were unsuccessful. (Author abstract reprinted by permission of the American Chemical Society)

74-0687. Feil, V. J.; Lamoureux, C. H.; Styrvoky, E.; Zaylskie, R. G.; Thacker, E. J.; Holman, G. M. (Agr. Res. Serv., Metab. Radiat. Res. Lab., Fargo, ND 58102). **Metabolism of *o,p'*-DDT in rats.** *J. Agr. Food Chem. 21(6): 1072-1076; 1973.* (24 references)

The following compounds were identified in rat feces following a single oral dose of *o,p'*-DDT-^{14}C: *o,p'*-DDD (TDE), *o,p'*-DDT, 3-hydroxy-2,4'-DDD, 3-hydroxy-2,4'-DDT, 4-hydroxy-3-methoxy-2,4'-DDD, 4-hydroxy-3-methoxy-2,4'-DDT, *o,p'*-DDA, 3-hydroxy-2,4'-DDA, 4-hydroxy-3-methoxy-2,4'-DDA, glycine conjugate of *o,p'*-DDA, *o,p'*-dichlorobenzhydrol, serine conjugate of *o,p'*-DDA, 4-hydroxy-2,4'-DDA, and 5-hydroxy-2,4'-DDA. *o,p'*-Dichlorobenzhydrol was identified in rat urine. *o,p'*-DDD, *o,p'*-DDT, and *p,p'*-DDT were identified in abdominal fat. The presence of *p,p'*-DDT in the fat was due to biological concentration of a very low level in the dose rather than by biological conversion of *o,p'*-DDT. (Author abstract reprinted by permission of the American Chemical Society)

74-0688. McKinney, J. D.; Mehendale, H. M. (Nat. Inst. Environ. Health Sci., Nat. Inst. Health, Pub. Health Serv. and Dept. Health, Educ. Welfare, Research Triangle Park, NC 27709). **Formation of polar metabolites from aldrin by pea and bean root preparations.** *J. Agr. Food Chem. 21(6): 1079-1084; 1973.* (12 references)

The gas chromatographic analysis of the products from combined replicate incubations of aldrin with pea or bean root preparations has indicated the presence of a series of related polar metabolites (including dieldrin). All of the polar metabolites (from beans) detected by gc analysis were confirmed by chemical ionization-mass spectrometry. In vitro metabolism studies with synthetic standard polar metabolites showed that none of the systems appear to be intermediate in the formation of others. It is proposed that all but one (aldrin alcohol) of the polar metabolites could arise via a common intermediate cation or equivalent radical resulting from attack on aldrin by an activated electrophilic oxygen species. The enzyme behavior is similar to the mixed

function oxidase type, with an apparent stimulation by NADPH and formation of a product which could be the result of a NIH shift. The formation of the aldrin alcohol suggests that aldrin can be attacked by at least one other enzyme which can incorporate the elements of water. (Author abstract reprinted by permission of the American Chemical Society)

74-0689. Argyle, R. L.; Williams, G. C.; Dupree, H. K. (Great Lakes Fish. Lab., U.S. Bur. Sport Fish. Wildl., Ann Arbor, MI 48107). **Endrin uptake and release by fingerling channel catfish (*Ictalurus punctatus*).** *J. Fish. Res. Bd. Can. 30(11): 1743-1744; 1973.* (3 references)

Fingerling channel catfish (*Ictalurus punctatus*) offered diets containing 0.04-4.0 μg endrin/g food (dry weight) rapidly accumulated the pesticide. Amounts in the tissues were directly proportional to amounts in the food. Dietary endrin had no measurable effect on growth or mortality. After endrin was withdrawn from the diet, it rapidly disappeared and could not be detected after 41 days. In fish exposed to 0.5 μg endrin/liter of water, mortalities began at tissue levels of 0.7 μg endrin/g of wet whole fish and total mortality occurred at levels near 1.0 μg/g. (Author abstract by permission)

74-0690. Greaves, J. H.; Ayres, P. (Pest Infestation Contr. Lab., Min. Agr., Fish. Food, Hook Rise S., Tolworth, Surbiton, Surrey, England). **Warfarin resistance and vitamin K requirement in the rat.** *Lab. Anim. 7: 141-148; 1973.* (7 references)

The development of vitamin K deficiency, vitamin K requirement, and warfarin susceptibility was investigated in warfarin-resistant and susceptible rats. Normal clotting factor levels were observed in warfarin-susceptible Wistar and wild rats, and generally lower factor levels were found in warfarin-resistant animals, particularly males. After exposure to a vitamin K deficient diet for several days the reduction in clotting-factor activity was more rapid in resistant strains than in susceptible counterparts. Severe hypoprothrombinemia developed quickly in a Welsh-derived HW strain (resistant), more slowly in a Scottish-derived HS strain (resistant), and slowest in Wistar rats. Clotting factor activity declined more slowly in hybrids of Wistar and resistant rats than in parent animals. Vitamin K requirement of the hybrids was intermediate or resembled that of the Wistar parent. Mortality results indicated that resistance of Scottish origin is an incompletely dominant trait, while the Welsh-derived resistance is a dominant trait.

74-0691. Clegg, D. E.; Martin, P. R. (Animal Res. Inst., Dept. of Primary Ind., Yeerongpilly, Queensland, Australia). **Residues of the carbamate acaricide, 3-methyl-5-isopropylphenyl-*N*-methylcarbamate (promacyl) and two metabolites in the tissues and milk of cattle.** *Pestic. Sci. 4(4): 447-457; 1973.* (13 references)

In order to assess some of the residue characteristics of the experimental carbamate acaricide, 3-methyl-5-isopropylphenyl-*N*-(*n*-butanoyl)-*N*-methylcarbamate (promacyl) a 0.2% aqueous emulsion was applied to cattle in a series of five trials, and in a sixth, the technical product was added to the feed of stalled cattle. A method of analysis involving the formation of a derivative suitable for gas chromatographic analysis on electron capture detection mode was developed. Separate estimations of levels of the parent compound and the metabolites, 3-methyl-5-isopropylphenyl-*N*-methylcarbamate and 3-methyl-5-isopropylphenol, were carried out on fatty tissues and butterfat, but for non-fatty tissues "total" levels, which were a combined estimate of 3-methyl-5-isopropylphenol itself and all substances hydrolyzable to it, were estimated and quoted as promacyl. The highest group average level of the parent compound was 0.9 ppm in fatty tissues 24 hr after the last of 8 applications at 3 day intervals. In a single spray trial the maximum group average of 0.7 ppm in fatty tissues 24 hr after treatment fell to 0.2 ppm after 5 days. Residues in butterfat 7 hr after a single dermal application showed a maximum level of 1.2 ppm, and this declined to 0.1 ppm on the seventh day after treatment. "Total" residues in non-fatty tissues were of the order of 1/10 those found in fatty tissues. (Author abstract by permission)

74-0692. Jordan, L. S.; Jolliffe, V. A. (Plant Sci. Dept., Univ. California, Riverside, CA 92502). **Simazine dealkylation in conjunction with citrus roots.** *Pestic. Sci. 4(4): 467-472; 1973.* (9 references)

Simazine was metabolized by dealkylation in the presence of citrus tree roots growing in nutrient solution. Dehalogenation to hydroxysimazine was not observed. Removal of citrus roots from the solution caused dealkylation to cease. Dealkylation did not occur in the nutrient solution in the absence of roots. (Author abstract by permission)

74-0693. Buckland, J. L.; Collins, R. F.; Henderson, M. A.; Pullin, E. M. (Res. Lab., May and Baker Ltd., Dagenham, Essex, RM10 7XS England). **Radiochemical distribution and decline studies with bromoxynil octanoate in wheat.** *Pestic. Sci. 4(5): 689-700; 1973.* (7 references)

Bromoxynil octanoate labeled with ^{14}C in the *ring* or in the *cyano*-group was applied to wheat seedlings of the two-leaf or fully-tillered stage and at rates equivalent to up to 16 oz a.i./acre. The plants were grown either in environmental chambers under controlled conditions for up to 28 days or outdoors under field conditions for various periods up to harvest. Initially, elimination of radioactivity occurred more rapidly with bromoxynil-*cyano*-[^{14}C]-octanoate than with bromoxynil-*ring*-[^{14}C]-octanoate, indicating metabolic attack on the *cyano* group. Under outdoor conditions with *ring*-

[^{14}C]-herbicide applied at the two-leaf stage, only 12% of the radioactivity was retained after 28 days, principally in the treated leaves. When application was made at fully-tillered stage, about 33% of the ^{14}C was retained after 56 days, almost entirely in the treated senescent leaves at the base of the plant. There was very little translocation of the herbicide or of any major metabolite. The level of radioactivity in harvested grain and in straw more than 7.5 cm above the ground was very low, even after very late application of *ring*-[^{14}C]-labeled herbicide. The amount of bromoxynil octanoate, together with any metabolite retaining part of the aromatic ring, did not collectively exceed the equivalent of approx. 0.01 parts/million bromoxynil octanoate. (Author abstract by permission)

74-0694. Phillips, J. A.; Whitehead, C. C. (Agr. Res. Council Poultry Res. Cent., Edinburgh, EH9 3JS, Scotland). **Studies on the performance of laying hens and broiler chickens fed low doses of tetrachlorvinphos.** *Pestic. Sci. 4(5): 753-757; 1973.* (9 references)

The effects of moderate to low doses of tetrachlorvinphos (TCVP) on egg production in hens and growth in broiler chickens have been studied. Dietary levels of 0, 50, and 500 mg TCVP/kg were fed to laying hens for 12 or 13 weeks. Adverse effects of the treatment on egg production, egg and yolk weight, egg hatchability, shell thickness, bird weight, or food consumption were not observed. During an 8-week study on broiler chickens fed dietary concentrations of 0, 2, 5, 50, 100, and 150 mg TCVP/kg, growth and food conversion were not significantly affected. (Author abstract by permission)

74-0695. Kovacicova, J.; Batora, V.; Truchlik, S. (Res. Inst. Agrochem. Technol., Bratislava, Predmestie, Czechoslovakia). **Hydrolysis rate and in vitro anticholinesterase activity of fenitrothion and *S*-methyl fenitrothion.** *Pestic. Sci. 4(5): 759-763; 1973.* (14 references)

Anticholinesterase activity in vitro of pure fenitrothion, *S*-methyl fenitrothion (SMF), and mixtures of both was studied using different sources of cholinesterase. SMF was two to three orders as active an inhibitor as fenitrothion. In the mixtures 1 and 5% SMF significantly influenced the I_{50} value of fenitrothion. The hydrolysis rates of both compounds are given. A method for the synthesis of pure SMF is also described. (Author abstract by permission)

74-0696. Siegel, M. R.; Tillman, R. W. (Univ. Kentucky, Lexington, KY). **The reaction sequence of chlorothalonil in cells of *Saccharomyces pastorianus*.** *Phytopathology 63(4): 448; 1973.*

^{14}C-Chlorothalonil and $Na_2{}^{35}SO_4$ were used to study the sequence of reaction of the fungicide in cells of *S. pastorianus*. Chlorothalonil was taken up by the cells and rapidly converted to substituted chlorothalonil-reduced glutathione (GSH) derivatives. Although the fungicide reacted with high molecular weight constituents like proteins during derivative formation, cell viability was not affected until all the GSH had reacted and thiol-dependent enzymes were inhibited. GSH is believed to have a protective effect on the thiol proteins.

74-0697. Siegel, M. R. (Dept. Plant Pathol., Univ. Kentucky, Lexington, KY, 40506). **Distribution and metabolism of methyl 2-benzimidazolecarbamate, the fungitoxic derivative of benomyl, in strawberry plants.** *Phytopathology 63(7): 890-896; 1973.* (18 references)

During continuous treatment of strawberry plants with methyl 2-benzimidazole-carbamate (MBC) for 36 and 88 days, 46 and 68% of the fungicide, respectively, was metabolized. The plants, which were maintained in Hoagland's solution containing MBC, accumulated the fungicide in roots and leaves produced before and during treatment; little of the material was absorbed by the foliage grown after treatment ended. Mature fruit accumulated only small amounts of the material when treated prior to or at the beginning of flower initiation. After 36- and 88-day treatments, a small amount of 2-aminobenzimidazole (2-AB) and a larger amount of unidentified metabolites were observed, the latter being either water-soluble or bound to the residue produced after exhaustive organic solvent extraction.

74-0698. Cecil, H. C.; Bitman, J.; Fries, G. F.; Harris, S. J.; Lillie, R. J. (U.S. Dept. Agr., ARS, Anim. Sci. Res. Div., Beltsville, MD 20705). **Changes in egg shell quality and pesticide content of laying hens or pullets fed DDT in high or low calcium diets.** *Poultry Sci. 52(4): 648-653; 1973.* (9 references)

White Leghorn pullets were fed diets containing 10 or 50 ppm technical DDT from two sources, 10 and 50 ppm combination of the pure isomers of DDT (80% *p,p'*-DDT: 20% *o,p'*-DDT), or 50 ppm *p,p'*-DDT in a standard breeder ration containing 3.5% calcium or in a low calcium diet containing 1.5% calcium. Other pullets were fed diets containing 0, 10, or 50 ppm technical DDT or 50 ppm *p,p'*-DDT in a ration containing 3.5% calcium for the first 20 weeks, 3% the next 12 weeks, and 1% calcium the final 8 weeks of the 40 week experiment. In addition to the pullets, hens in their second year of lay were fed diets containing 10 or 50 ppm *p,p'*-DDT in a 3.5% calcium ration. After two to four months of feeding DDT in a 3.5% calcium diet, egg shells from second year hens were significantly thinner than controls, but shells from pullets fed DDT were significantly thicker than control eggs. DDT had no effect on egg shell thickness of birds fed the low calcium diets. Pesticide residues in egg contents gradually increased during the first 3 to 4 months of feeding either 10 or 50 ppm technical DDT or *p,p'*-DDT or a combination of the isomers. A plateau in egg residues occurred after 4 months feeding. Eggs from birds fed *p,p'*-DDT in the

3.5% calcium diet had pesticide residues equal to the level of pesticide fed. However, pullets fed the pesticide in the 1.5% calcium diet had residue levels 1.4 X the level fed. After 40 weeks of pesticide treatment, abdominal fat residues were 15 to 19 X the level in the diet. Residues were higher in the fat of pullets fed the low calcium diet. Also, in the pullets fed the low calcium diet there was a greater retention of DDT as DDE. (Author abstract by permission)

74-0699. Poonacha, K. B.; Wentworth, B. C.; Chapman, A. B. (Dept. of Poultry Sci. and Genetics, Univ. of Wisconsin, Madison, WI 53706). **Genetic resistance to DDT in the Japanese quail *Coturnix coturnix japonica.*** *Poultry Sci. 52(3): 841-846; 1973.* (28 references)

Selection studies of resistance to DDT included eight generations of quail consisting of two selected lines and one control line. One selected line differed from the other in that, in addition to mass selection, birds were chosen on the basis of family merit. Selected lines were fed a diet containing 200 ppm DDT during the first 30 days of life. In order to test for resistance, part of the control lines were also given DDT diets, and the mortality of the control was compared to the mortality of the selected lines. Development of resistance started to appear after the third generation of selection. This was evidenced by the lower mortality among the selected lines than in the control line fed DDT. If the selected lines had stored DDT in the body, cold exposure or partial starvation (release of energy from the fat) would presumably increase the DDT levels in the blood and other sensitive tissue, causing mortality due to DDT toxicity. This was put to test by exposing DDT-fed resistant lines and the DDT-fed control group to partial starvation and cooler temperatures. Under these conditions the selected lines were lower in mortality than the control. Among the resistant lines, the females were less resistant than males. These lines showed some cross-resistance to another hydrochlorinated pesticide, lindane. A conclusion drawn from this study is that it is possible to develop a strain of quail resistant to DDT out of the less resistant population by selection. (Author abstract by permission)

74-0700. Lillie, R. J.; Cecil, H. C.; Bitman, J. (U.S. Dept. of Agr., Beltsville, MD 20705). **Methoxychlor in chicken breeder diets.** *Poultry Sci. 52(3): 1134-1138; 1973.* (6 references)

The feeding of 25, 100, 250, 500, 1000, 2500, and 5000 ppm methoxychlor to caged Single Comb White Leghorn pullets for a 16-week period had no effect on body weight gains, egg production, feed consumption, livability, fertility and hatchability, egg weight, or eggshell thickness as compared with the controls. The fertilizing capacity of cockerels fed either 500 or 5000 ppm methoxychlor in an 8-week period did not differ from that of the control males. Methoxychlor accumulation in egg contents reached an equilibrium concentration of 0.4 percent the dietary level after 3 weeks feeding. No detectable residues were found in fat of birds fed 25 ppm or in eggs from birds fed 25, 100, or 250 ppm of methoxychlor. Egg residues were less than 0.5 ppm in all groups 3 weeks after the hens were returned to control feed. Residues in the carcass fat were six- to eight-fold higher than that of egg contents. (Author abstract by permission)

74-0701. Smalley, H. E. (Vet. Toxicol. Entomol. Res. Lab., A.R.S., USDA, College Station, TX 77840). **Toxicity and hazard of the herbicide, paraquat, in turkeys.** *Poultry Sci. 52(4): 1625-1628; 1973.* (7 references)

The toxicity of the herbicide, paraquat, in turkeys varied according to administration route. The lethal dose was about 100 mg/kg by intraperitoneal injection, 20 mg/kg by intravenous injection, 290 mg/kg by oral administration, and 500 mg/kg by dermal application. Signs of oral paraquat poisoning include a fetid diarrhea, ruffled feathers, dullness or listlessness, and anorexia. Short, terminal convulsions were seen in birds dosed orally. Necropsy lesions were primarily those of extensive gastroenteritis in birds dosed orally; lesions of dermal poisoning were emaciation and blistering and cracking of skin with exudate matting the feathers. Turkeys kept in small range plots for 30 days, beginning 24 hours after the plots were sprayed with paraquat at the recommended rate (2 oz cation/acre) and at 100 times the recommended rate (200 oz cation/acre), had no signs of toxicity. (Author abstract by permission)

74-0702. Lotlikar, P. D.; Wasserman, M. B.; Luha, L. (Fels Res. Inst., Temple Univ. School Med., Philadelphia, PA 19140). **Effect of 3-amino-1,2,4-triazole pretreatment on *N*-and ring-hydroxylation of 2-acetylaminofluorene by the rat.** *Proc. Soc. Exp. Biol. Med. 144(2): 445-449; 1973.* (20 references)

Urinary excretion of *N*-hydroxy-acetylaminofluorene increased 3-fold after administration of 2-acetylaminofluorene when rats were pretreated for several days with amitrole (3-amino-1,2,4-triazole) (1g/kg). Urinary excretion of ring-hydroxy metabolites also increased with this pretreatment. Bile-duct ligation caused a similar increase in urinary excretion of *N*-hydroxy-acetylaminofluorene and an increase in excretion of the 7-hydroxy metabolite. Control and amitrole-pretreated rats showed the same increase in these metabolites after ligation. Amitrole treatment inhibited ring-hydroxylation of acetylaminofluorene by liver microsomes about 25% and enzymatic esterification of *N*-hydroxy-acetylaminofluorene by liver cytosol preparations about 25%.

74-0703. Menzer, R. E. (Dept. Entomol., Univ. of Maryland, College Park, MD 20742). **Biological oxidation and**

conjugation of pesticidal chemicals. *Residue Rev. 48: 79-116; 1973.* (120 references)

In an effort to neutralize biological effects living organisms metabolize foreign compounds by oxidation, hydrolysis, and sometimes conjugation, with excretion or storage of terminal metabolites. Oxidation reactions can be characterized according to the moiety on the pesticide. Aromatic ring compounds are hydroxylated, sometimes with displacement of other substituents such as halogens. Other ring compounds such as cyclodienes may also be hydroxylated. Aliphatic hydrocarbons including ring side chains may be oxidized to give a characteristic series of metabolites. Ring methyl groups are converted to benzyl alcohol derivatives, followed by conversion to the carboxylic acids. Higher alkyl side chains are hydroxylated in several ways and occasionally converted to carboxylic acids. Alkyl substituted amides are dealkylated by an oxidative process with formation of hydroxyalkyl derivatives which may only sometimes be isolated. Aliphatic sulfur compounds are almost invariably converted very rapidly and in large quantities to the sulfoxide derivatives, with subsequent conversion to a lesser extent to the sulfone derivatives. Oxidation reactions usually result in a free hydroxyl group or a free carboxy group which may then be conjugated with glucose in plants and insects or with glucuronic acid or sulfate in animals. During conjugation of some pesticides in plants and animals, glutathione may react with some compounds directly or may serve as a cofactor in a transferase reaction. (Author abstract by permission, abridged)

74-0704. Kilgore, W. W.; Li, M. (Off. Water Programs, Applied Technol. Div., Environ. Protect. Agency, Washington, DC). **The carcinogenicity of pesticides.** *Residue Rev. 48:141-161; 1973.* (56 references)

The distinction between tumorigenicity and carcinogenicity of pesticides has been the basis of scientific controversy for years. Considering the high pesticide dosages required to produce tumorigenic responses in experimental animals, the low levels of pesticide residues actually encountered by man, and the unanswered question of the validity of extrapolation of animal data to man, suspect pesticides cannot be categorized as definitely carcinogenic to man. Despite extensive reviews, DDT and its major metabolites, DDT and TDE, have not been determined carcinogenic, although some officially established committees have judged these, as well as aldrin and dieldrin, positive for tumor induction. Synergistic effects of pesticides as related to carcinogenicity to man and animals have been discussed, but there is not enough information to form firm conclusions at present. An association between liver tumors and induction of microsomal enzymes by pesticides has not been clearly established either. Although pesticide degradation products may be more toxic than their parent compounds, little is known about their tumorigenicity or carcinogenicity. Difficulty in extrapolating toxicity results from animals to man and great variation in results obtained necessitate standardized test procedures. (Author abstract by permission, abridged)

74-0705. Shanley, B. C.; Taljaard, J. J. F.; Deppe, W. M.; Joubert, S. M. (Dept. Chem. Pathol., Univ. Natal, Durban, South Africa). **Haem biosynthesis in 'experimental porphyria'.** *S. Afr. J. Lab. Clin. Med. 18(3): 118; 1972.*

Experimental symptomatic porphyria induced by a combination of iron overload and hexachlorobenzene decreased total liver heme and cytochromes P450 and B_5, incorporation of (^{14}C)-succinate into liver heme, and uroporphyrinogen decarboxylase activity. HCB, in both siderotic and non-siderotic rats, markedly altered the redox state of the liver cell cytoplasm. The ratio of NAD:NADH was 2-fold greater than normal. This HCB induced change may lead to decreased ability to maintain porphyrinogens in the reduced form. Iron overload may impair uroporphyrinogen decarboxylase activity and increase degradation rate of microsomal drug detoxifying cytochromes.

74-0706. Besch, W. K.; Juhnke, I.; Kemball, A. (Landesstelle fuer Gewaesserkunde und wasserwirtschaftliche Planung Baden-Wuerttemberg, Karlsruhe, Germany). **Zur Standardisierung des Fischwarntestes. [Standardization of the fish toxicity predictive test.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 31-37; 1972.* (15 references) (German)

A standard method is proposed for the rapid routine toxicity testing of pesticides to fish. Test fish, one-year-old carp or rainbow trout, are kept in steadily flowing water containing the pesticide to be tested. Normal fish maintain their position in the water flow in front of an electroshock field, but poison-weakened fish are swept to a grid in the field. A specified critical frequency and duration of contact with the grid are used as the alarm threshold, based on variations in the susceptibility of the fish to a given pesticide as a function of age and season. This standard method is also suitable for laboratory tests since the reaction time is proportional to the poison concentration in the water. Tests with carp in water containing 0.05 mg of DDT per liter showed reduced susceptibility in fall rather than in spring. Carp were less sensitive to DDT at temperatures below 10°C.

74-0707. Martens, R. (Inst. fuer Bodenbiol. und Isotopenlaboratorium, Forschungsanstalt fuer Landwirtschaft, Braunschweig, Germany). **Der Abbau von Endosulfan durch Mikroorganismen des Bodens. [Degradation of endosulfan by soil microorganisms.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 167-173; 1972.* (German)

The degradation of endosulfan by soil microorganisms was studied in test cultures and in different

soil types in laboratory experiments using ^{14}C-labeled endosulfan in concentrations up to 1,000 ppm. Endodiol, endosulfate, endoether, α- and β-endosulfan, endohydroxyether, chlorendic acid, and endolactone were identified as the metabolites of endosulfan in soil cultures. Predominant endosulfate formation by fungi, predominant diol formation by bacteria, and rather uniform rates of formation of the different metabolites by actinomycetes were observed. The chemical hydrolysis of endosulfan at pH values over 7 may be inhibited by the soil microorganisms, and biological degradation becomes important first at pH values below 7. The rate of carbon dioxide formation in most of the soil investigated was ca. 0.3 to 0.5% in 15 weeks; CO_2 formation rates of 2.9 and 5.4% were determined for a basic brown soil and a chernozem. The rate of sulfate formation during the same period was 30-60%. The rate of formation of polar metabolites in a tropical soil reached 11%.

74-0708. Bauer, U. (Inst. fuer Wasserforschung GmbH, Geisecke/Ruhr, Germany). **Anreicherung von insektiziden Chlorkohlenwasserstoffen und PCB in Algen. [Concentration of insecticidal hydrocarbons and PCBs by algae.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 211-219; 1972.* (26 references) (German)

The uptake of 3-20 ppb and 30-200 ppb concentrations of 1,2,4,5-T (tetrachlorobenzene), α-BHC, lindane, heptachlor, aldrin, Telodrin (isobenzan), heptachlor epoxide, endosulfan, dieldrin, *o,p'*-DDT, *p,p'*-DDD (TDE), *p,p'*-DDT, methoxychlor, and Clophen (PCBs) by algae was studied. The cumulation factors, determined for the different pesticides in *Cladophora*, decreased with increasing concentrations in the water. Water solubility of the pesticides and their adsorption by *Cladophora* were inversely related. The desorption of the pesticides from *Cladophora* was directly proportional to the water solubility. The adsorption capacity of the algae ranged from 2.1 μg/g of dry mass of *Cladophora* for α-BHC to 97.5 μg/g for Telodrin. The cumulation factors determined for the respective 1,2,4,5-T, α-BHC, lindane, heptachlor, aldrin, Telodrin, heptachlor epoxide, endosulfan, dieldrin, *o,p'*-DDT, *p,p'*-DDD, *p,p'*-DDT, and methoxychlor concentrations of 70, 90, 31, 80, 71, 142, 182, 150, 127, 125, 130, 190, 116, and 197 μg/l. were 254, 498, 67, 180, 423, 596, 534, 260, 53, 620, 700, 476, 834, and 81. The adsorption rate was highest during the first 24 hr of the experiment. The desorption from *Cladophora* was most intense for α-BHC, and least intense for Telodrin, methoxychlor, and 1,2,4,5-T. The cumulation factors determined for Clophen in *Tribonema* and *Ulothrix* ranged from 28 to 50. Incorporation of Clophen by algal cell proteins was observed. The findings indicate the suitability of algae for the removal of organochlorine pesticides and PCBs from water, especially in groundwater supplementation by slow sand filtration.

74-0709. Heuss, K. (Biologischer Dienst, Landesanstalt f. Gewaesserkunde und Gewaesserschutz Nordrh-Westf., Krefeld-Huelserberg, Germany). **Zur Wirkung einiger Herbizide auf limnische Protisten-Gemeinschaften. [Effects of some herbicides on limnic plankton communities.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 221-229; 1972.* (6 references) (German)

The effects of paraquat, amitrole, dichlobenil, and terbutryne on protophytes and protozoa were studied in drainage ditches. The paraquat, dichlobenil, amitrole, and terbutryne expenditures for weed control were 0.6 ppm, 1 ppm, 40 kg/ha, and 0.1 ppm. All herbicides immediately decimated the plankton populations which were restored in about two weeks. Autotrophic and heterotrophic species were equally affected by the herbicides. The restoration of the plankton population was to a major part due to the less affected benthic populations. The effect of dichlobenil on the plankton communities was the weakest. The normalization of the plankton communities following paraquat treatment was associated with the proliferation of Euglenophytes (Euglena and Trachelomonas).

74-0710. Knauf, W.; Schulze, E. F. (Bereich C - Pflanzenschutzforschung- Biologie, Frankfurt/Main, Germany). **Langzeiteinfluss subletaler Herbiziddosen auf einige Vertreter der Wasserfauna und -flora am Beispiel von Linuron und Monolinuron. [Long-term effects of sublethal herbicide doses on some representatives of the water fauna and flora, based on the example of linuron and monolinuron.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 231-239; 1972.* (6 references) (German)

The acute and chronic toxicity of linuron and monolinuron were studied on the water fauna and flora. The LC50 values, determined for linuron in *Limnaea stagnalis*, *Tubifex* species, *Aelosoma variegatum*, *Daphnia magna*, *Aedes aegypti*, *Lebistes reticulata*, *Xiphophorus helleri*, *Idus melanotus*, and *Carassius auratus*, are 70, 16, 70, 4, 85, 8, 4.6, 12, and 15 ppm. The corresponding LC50 values for monolinuron are 85, 90, 24, 7.5, 120, 55, 20, 65, and 50. The LC50 values of linuron and monolinuron in *Lemma* were 0.45 and 2.4 ppm; those in *Rhiziella* 1.8 and 30 ppm. The photosynthetic activity of *Chlorella* was inhibited 50% by 0.96 ppm linuron and 0.3 ppm monolinuron. Linuron and monolinuron concentrations of 0.1 ppm did not cause behavioral and physiological changes in carp, *Limnaea stagnalis*, and *Tubifex* species in a 28-day experiment. Concentrations of 1 ppm did not influence the growth of *Limnaea stagnalis*; 1 ppm of monolinuron increased the irritability of fish. The respective linuron and monolinuron concentrations of 0.2 and 1 ppm slowed down cell division of *Chlorella*, and reduced oxygen production. The findings demonstrate the safety in using linuron and monolinuron in the prescribed doses in fish ponds and other standing waters.

74-0711. Bathe, R.; Ullmann, L.; Sachsse, K. (Ciba-Geigy A.G., Sisseln, Switzerland). **Toxizitaetsbestimmung von Pflanzenschutzmitteln an Fischen. [Determination of pesticide toxicity to fish.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 241-256; 1973.* (13 references) (German)

A routine procedure for the determination of the ichthyotoxicity of pesticides and actual toxicologic tests are described. The routine toxicological tests for the determination of the 96 hr-LC50 values were performed with *Salmo gairdnerii, Carassius carassius* (L.), *Ictalurus ameiurus, Lepomis macrochirus,* and *Lebistes reticulatus* Peters. The 96 hr-LC50 values, determined for atrazine, simazine, ametryne, simetryne, prometon, fluometuron, chloroxuron, chlorobromuron, metobromuron, chlorotoluron, bromophenoxime, phosphamidon, diazinon, Supracid (GS 13005), and *p,p'*-DDT in *Salmo gairdnerii* were 8.8, over 100, 3.4, 7, 70, 47, over 100, 5, 36, 35, 0.20, 20, 8, and 0.028 ppm. The corresponding values obtained for *Carassium carassium* (L.) are 76, over 100, 27, 27, 70, 170, 120, over 150, 8, 40, over 100, 0.0, 600, 5, 30, and 0.025 ppm. Specimens of *Salmo gairdnerii* and *Carassius carassius* kept in water with 0.005 ppm of *p,p'*-DDT had concentrations in their muscles and other edible parts 50 times greater than that in water by the 72nd hour. The cumulation factor determined for comparable specimens kept in water with 100 ppm of atrazine or fluometuron was 2-3. While *p,p'*-DDT residues in the fish muscles did not degrade within the first 16 days of the experiments, both fluometuron and atrazine degraded considerably during the first 8 days. Pesticide classes of highly toxic, toxic, moderately toxic, and non-toxic if 96 hr-LC50 values are below 0.5 ppm, 0.5-5 ppm, 5-50 ppm, and over 50 ppm, respectively are proposed.

74-0712. Neururer, H. (Bundesanstalt fuer Pflanzenschutz, Vienna, Austria). **Der Sicherheitsquotient als Massstab fuer die fischtoxikologische Beurteilung von Herbiziden im Wasser. [The safety factor as an index for evaluating the toxicity of herbicides in water to fish.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 257-263; 1972.* (3 references) (German)

Herbicide concentrations in water, necessary to achieve 90% efficiency in aquatic weed control, and LC10 values for *Cyclops, Daphnia, Tubifex,* and fish species were determined for different pesticides in laboratory experiments to obtain safety factors for the evaluation of the ichthyotoxicity of pesticides. Safety factors represent the ratio of the LC10 values as determined for the most sensitive, useful species of the aquatic fauna, to the herbicide doses necessary for 90% efficiency in weed control. Herbicides with safety factors below 2 (class 1), such as 2,4-D and 2,4,5-T, must not be used in fisheries. Herbicides with safety factors between 2 and 10 (class 2), such as MH 30 (maleic hydrazide), should not be used in fisheries either, despite their reduced toxicity to the aquatic fauna. Herbicides of class 3 (with safety factors over 10) are suitable for use in fisheries; however, local concentrations occurring during introduction should not exceed 10-fold overdose. Such herbicides are dichlobenil, chlorthiamid, amitrole, paraquat, dalapon, diquat, and copper sulfate.

74-0713. Matsueda, S.; Ohtaki, Y.; Mikami, M.; Kudo, N. (Fac. Gen. Educ., Hirosaki Univ., Hirosaki, Japan). **[Relationship between human blood glutathione and serum cholinesterase activity.]** *Seikagaku (J. Jap. Biochem. Soc.) 45(2): 88-90; 1973.* (7 references) (Japanese)

Reduced glutathione (GSH) was administered by injection to a normal healthy person and to victims of methyl parathion poisoning. Relationships between blood GSH and serum cholinesterase activity were examined. At 30 min after injection of 600 mg of GSH, the serum ChE activity remained at 0.8-1.3 ΔpH and the total GSH was 40-50 mg/100 ml in a normal subject. Between 60 and 90 min, ChE activity drastically increased, whereas GSH stayed approximately constant. An acute poisoning victim was given a similar injection; ChE fluctuated between 0.4 and 0.6 Δ pH, and the total blood GSH varied, parallel to the changes in ChE, between 30 and 40 mg. There was no great increase in serum ChE activity at any time. A chronic poisoning patient, also given a similar injection, showed distinct parallel fluctuations in serum ChE and blood GSH. Between 60 and 90 min, both GSH and ChE activity drastically increased, and between 90 and 120 min, they dropped drastically, showing the same curve. This fact suggested that GSH may have acted directly on serum ChE activity. The mechanism of the parallelism is not clear. Further studies on the correlations of GSH with other blood enzymes may resolve the mechanism involved.

74-0714. Matsueda, S.; Ohtaki, Y.; Mikami, M.; Kudo, N. (Dept. of Chemistry, Hirosaki Univ., Hirosaki, Japan). **[Inhibition of rat blood cholinesterase activity by ethyl parathion.]** *Seikagaku (J. Jap. Biochem. Soc.) 45(2): 91-93; 1973.* (6 references) (Japanese)

The in vivo inhibition of cholinesterase by organophosphate pesticides is well known; hitherto almost no effect of organophosphates on blood ChE activity in vitro has been reported. Experiments were conducted on rat blood in vitro with ethyl parathion (parathion). The result showed that serum pseudo-ChE was not inhibited – only true ChE activity was inhibited. Serum and erythrocyte ChE activities were measured by the improved acetylthiocholine-DTNB method: 0.7 ml of rat blood and various concentrations of parathion (0.3 ml) were mixed. Each sample was incubated at 37°C for 30 min, with gentle agitation. At the end of the period, 30μl. of blood was taken from each tube and the ChE activity measured. The maximum inhibition of erythro-

cyte ChE occurred at 10^{-3} mol. Upon addition of parathion, erythrocyte ChE activity was reduced rapidly up to 60 min, reaching a minimum at 60 min and not changing after that. On the other hand, the serum ChE activity increased slightly in 0-30 min, and no change appeared after that. It was concluded that parathion inhibits only erythrocyte ChE activity in vitro, and that in vitro, parathion does not inhibit rat serum ChE activity.

74-0715. Poloz, D. D.; Nikolayev, K. A. (All-Union Inst. Exp. Vet., Moscow, USSR). **Biokhimicheskiy mekhanizm deystviya fosfororganicheskikh soyedineniy na organizm zhivotnykh. [Biochemical mechanism of action of organophosphorus compounds on animals.]** *Sel'skokhoz. Biol. 8(2): 219-223; 1973.* (10 references) (Russian)

The effects of trichlorfon and phosphamide (dimethoate) on rabbit erythrocyte membrane and cerebrum acetylcholinesterase and on transport Na^+, K^+-ATPase activities were studied in vitro and in vivo. Phosphamide in a dilution of 1:1,000 suppressed the Na^+, K^+-ATPase and acetylcholinesterase activities in erythrocyte membrane homogenizates by 100%. The rates of Na^+, K^+-ATPase and acetylcholinesterase inhibition due to dilutions of 1:25,000 and 1:50,000 were 88.22% and 71.65% and 45.3% and 45.3%, respectively. Trichlorfon in a dilution of 1:1,000 totally suppressed both enzyme activities; in dilutions of 1:25,000 and 1:50,000 it inhibited the Na^+, K^+-ATPase and acetylcholinesterase activities by 79.47% and 94.9% and by 41% and 74.7%. In brain homogenizates trichlorfon and phosphamide inhibited the Na^+, K^+-ATPase activities by 69.78% and 72.08%, respectively. Single 750 mg/kg (LD100) doses of phosphamide reduced the Na^+, K^+-ATPase and acetylcholinesterase activities 92.46% and 92.29% in vivo. The reactivators dipyroxime and tropacine and their combinations effectively protected the cerebrum against the enzyme inhibiting action of trichlorfon and phosphamide.

74-0716. Wisniewski, K.; Panek, R.; Szymanski, A.; Killar, M.; Daniluk, J. (Pharmakol. Inst. und Radiol. Forschungszentrum, Med. Akad. Bialystok, Poland). **Untersuchungen ueber die strahlenschuetzenden Eigenschaften von Trichlorphon. [Research on the radiation-protective properties of trichlorfon.]** *Strahlentherapie 145(2): 178-186; 1973.* (29 references) (German)

The x-ray protective action of trichlorfon was studied on Wistar rats given 25, 100, and 200 mg/kg doses of trichlorfon i.p. 3 hours before irradiation with 23.3 R/min. Only the dosage of 100 mg/kg produced a satisfactory radiation-protective effect with regard to the survival rate. At this level, a (radiation) dose-reducing factor of 1.19 was determined. Trichlorfon prevented to a certain degree the decrease in the number of leukocytes on the 7th and 14th days following irradiation. Trichlorfon also abated the irradiation-induced increase in the lipid peroxide level, without influencing the *O*-quinone level. Trichlorfon intensified the cathepsin activity in healthy animals and largely prevented the radiation-induced increase in cathepsin level. The metabolic effects observed after administration of a radiation-protective dose of trichlorfon (increases in oxygen consumption and cathepsin activity) can be described as "biochemical cell shock." Oxygen and cathepsin seem to play a major role in radiation-protection action, whereas the inhibition of acetylcholinesterase activity is insignificant.

74-0717. Panek, R.; Wisniewski, K.; Sarosiek, W.; Daniluk, J.; Szymanski, A. (Pharmakol. Inst. und Radiol. Forschungsinst., Med. Akad., Bialystok, Poland). **Untersuchungen ueber die strahlenschuetzenden Eigenschaften und den Wirkungsmechanismus von Phenchlorphos. [Research on the radiation protective properties and the mode of action of fenchlorfos.]** *Strahlentherapie 145(2): 187-196; 1973.* (22 references) (German)

The general action mechanism and the x-ray protective properties of fenchlorfos (ronnel) were studied in Wistar rats given single 65, 250, and 625 mg/kg (1/20, 1/15, and 1/2 LD50) oral doses. Test animals were exposed to x-rays at 23.5 R/min. Fenchlorfos doses of 250 and 625 mg/kg increased hepatic cathepsin activity; inhibited acetylcholinesterase activity in blood and brain; and considerably increased the lipid peroxide, liver lactic acid, and the cytochrome oxidase levels. Succinic acid and hepatic *O*-quinone levels as well as the succinate dehydrogenase activity were unchanged. In irradiated, fenchlorfos-treated rats, the radiation LD50 increased from 400 to 625 R (dose reduction factor 1.42). The radiation-induced increase in the *O*-quinone level was inhibited. The rate of rise in the lipid peroxide level and cathepsin activity decreased, and there was a noticeable reduction in the hepatic lactic acid level. A more pronounced increase in the hepatic succinate level, an unchanged increase in the cytochrome oxidase activity, and a negligible increase in the succinate dehydrogenase activity were observed. Fenchlorfos apparently exerts a strong radiation-protective effect by influencing various metabolic processes, mainly energy-producing cytochemical processes.

74-0718. Wu, T. P. (Dept. of Botany, Nat. Taiwan Univ., Taiwan). **Some cytological effects of Treflan and mitomycin C on root tips of *Vicia faba* L.** *Taiwania 17(3): 248-253; 1972.* (10 references)

Root tip cells of *Vicia faba* seedlings exposed to Treflan (trifluralin) at 20 and 200 ppm had an increased frequency of chromosome bridges, acentric fragments, and ball-metaphase. At 36 hr, the frequency of total aberrations was 7.98% compared to 0.57% in controls. Low mitotic indices were noted in seedlings exposed to 20 ppm for 6 and 12 hr. The recommended field applica-

tion dosage of Treflan is 0.75/A., which produces a solution containing 3,000 ppm.

74-0719. Khera, K. S. (Health Protection Branch, Dept. Nat. Health Welfare, Ottawa, Ontario, Canada). **Ethylenethiourea: teratogenicity study in rats and rabbits.** *Teratology 7(3): 243-252; 1973.* (16 references)

Ethylenethiourea was administered orally once a day to female rats from days 21-42 before conception to day 15 of gestation, or from days 6-15 or 7-20 of gestation. Fetal survival was not affected at any level studied, but mean fetal weight was reduced at 40 and 80 mg/kg, and a number of abnormalities occurred at 10 to 80 mg/kg. Abnormalities included meningoencephalocele, meningorrhagia, meningorrhea, hydrocephalus, obliterated neural canal, abnormal pelvic limb posture with equinovarus, and short or kinky tail. None of these was observed in rabbits after a similar dosage regimen, but an increased incidence in resorption sites and decreased brain weight were observed at 80 mg/kg. Females given up to 40 mg/kg daily exhibited no signs of toxicity.

74-0720. Suzuki, Y. (Dept. Toxicol., Nat. Inst. of Hyg. Sci., Tokyo, Japan). **[Toxicological study of ethyl-*p*-nitrophenyl phosphonothionate [*sic*] (EPN) in rats, with special reference to the toxicity criteria for the determination of its residual toxicity in food.]** *Toho Igakkai Zasshi (J. Med. Soc. Toho Univ.) 20(1/2): 126-144; 1973.* (12 references) (Japanese)

Acute and six-month toxicity tests with EPN were performed on Wistar rats. In the acute study male rats were given EPN dissolved in olive oil by stomach tube. In the chronic study groups of 18 male and female rats were fed diets containing 3, 15, and 75 ppm of EPN for six months. The LD50 in the acute study was 37.5 mg/kg. At the higher doses brain and diaphragm ChE were markedly inhibited, and at the lower doses, surviving animals still showed some signs of red blood cell and serum ChE inhibition two weeks after administration of EPN. In the chronic experiment ChE inhibition was observed in diaphragm, liver, red blood cells, and serum at 15 and 75 ppm in male rats; brain and diaphragm ChE of female rats were inhibited at 75 ppm, and liver, RBC, and serum ChE at 15 and 75 ppm. The degree of ChE inhibition paralleled the dose. The ChE inhibitions measured after one month in the chronic experiment did not increase further; at two weeks after termination of EPN administration ChE activities had returned to initial levels in most tissues and were elevated in some. The rate of *p*-nitrophenol excretion relative to the amount of EPN ingested tended to decrease with time in male rats, but not in females. The *p*-nitrophenol excretion was generally lower in female rats than in males. General toxicologic indices were not changed appreciably, and the only noteworthy histological finding was depression of submandibular gland secretion after feeding EPN at 75 ppm for three months. (From author abstract)

74-0721. Norman, B. J.; Roth, J. A.; Neal, R. A.* (Cent. Environ. Toxicol., Dept. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN 37232). **Effect of temperature on the mixed function oxidase-catalyzed metabolism of *O,O*-diethyl *p*-nitrophenyl phosphorothionate (parathion).** *Toxicol. Appl. Pharmacol. 26(2): 203-208; 1973.* (12 references)

Using hepatic microsomes from both untreated and phenobarbital-treated rats, the energies of activation for the hepatic mixed function oxidase-catalyzed metabolism of parathion to paraoxon and to diethyl phosphorothioic acid were found to be significantly different. In addition, the energies of activation for the metabolism of parathion to paraoxon and to diethyl phosphorothioic acid were found to be decreased by pretreatment of rats with phenobarbital. A decrease in the energy of activation of NADPH-cytochrome P-450 reductase was not seen in phenobarbital-treated as compared to untreated animals. (Author abstract by permission)

74-0722. Ecobichon, D. J.; Comeau, A. M. (Dept. Pharmacol., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Hepatic aliesterase sensitivity to dichlorvos and diisopropylfluorophosphate.** *Toxicol. Appl. Pharmacol. 26(2): 260-263; 1973.* (19 references)

Unlike mammalian plasma pseudocholinesterases where the I50 values for dichlorvos are 100-fold higher than those for diisopropylfluorophosphate (DFP), mammalian hepatic aliesterases were inhibited to the same extent by concentrations of these two agents which did not differ more than 4-fold within species. Feline hepatic aliesterases were an exception in that dichlorvos was 100 times less potent than diisopropylfluorophosphate. (Author abstract by permission)

74-0723. Jacobsen, P. L.; Spear, R. C.; Wei, E. (Sch. Pub. Health, Univ. California, Berkeley, CA 94720). **Parathion and diisopropylfluorophosphate (DFP) toxicity in partially hepatectomized rats.** *Toxicol. Appl. Pharmacol. 26(2): 314-317; 1973.* (11 references)

The toxic effects of parathion and DFP in male rats either increased or remained unchanged after partial hepatectomy. LD50 values and blood cholinesterase activities were used as indices of toxicity. These results suggest that parathion toxicity is most likely not due to hepatic conversion of parathion to paraoxon. (Author abstract by permission)

74-0724. Piper, W. N.; Rose, J. Q.; Leng, M. L.; Gehring, P. J. (Chem. Biol. Res., Dow Chem. Co., Midland, MI 48640). **The fate of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) following oral administration to rats and dogs.** *Toxicol. Appl. Pharmacol. 26(3): 339-351; 1973.* (24 references)

Clearance of ^{14}C activity from the plasma and its elimination from the body of rats and dogs were determined after single oral doses of [*carboxy*-^{14}C]2,4,5-T. The half-life values for the clearance of ^{14}C activity from the plasma of rats given doses of 5, 50, 100, or 200 mg/kg were 4.7, 4.2, 19.4, and 25.2 hr, respectively; half-lives for elimination from the body were 13.6, 13.1, 19.3, and 28.9 hr, respectively. The apparent volume of distribution also increased with dose. Urinary excretion of unchanged 2,4,5-T accounted for most of the ^{14}C activity eliminated from the body of rats. A small amount of unidentified metabolite was detected in the urine when rats were given 100 or 200 mg/kg but not 5 or 50 mg/kg. These results show that the distribution, metabolism, and excretion of 2,4,5-T are markedly altered when large doses are administered. In dogs given 5 mg/kg, the half-life values for clearance from plasma and elimination from the body were 77.0 and 86.6 hr, respectively, offering a plausible explanation of why 2,4,5-T is more toxic in dogs than in rats. Appreciable excretion in the feces was noted, and three unidentified metabolites were detected in urine of dogs, indicating a considerable difference in metabolism of 2,4,5-T by dogs and rats given the same dose. (Author abstract by permission)

74-0725. Gehring, P. J.; Kramer, C. G.; Schwetz, B. A.; Rose, J. Q.; Rowe, V. K. (Chem. Biol. Res., Dow Chem. Co., Midland, MI 48640). **The fate of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) following oral administration to man.** *Toxicol. Appl. Pharmacol. 26(3): 352-361; 1973.* (8 references)

Five human male volunteers ingested a single dose of 5 mg/kg 2,4,5-T without incurring detectable clinical effects. Concentrations of 2,4,5-T in plasma and its excretion were measured at intervals after ingestion. The clearances of 2,4,5-T from the plasma as well as its excretion from the body occurred via apparent first-order rate processes with half-lives of 23.10 and 23.06 hr, respectively. Essentially all of the 2,4,5-T was absorbed into the body and excreted unchanged in the urine. In the body, 65% was absorbed into the body and excreted unchanged in the urine. In the body, 65% of the 2,4,5-T resided in the plasma where 98.7% was bound reversibly to protein. The volume of distribution was 0.079 liters/kg. Utilizing the kinetic constants from the single dose experiment, the expected concentrations of 2,4,5-T in the plasma of individuals receiving repeated daily doses of 2,4,5-T were calculated. From these calculations, it was determined that the plasma concentrations would essentially reach a plateau after 3 days. If the daily dose ingested in mg/kg is A_0 the concentration in the plasma after attaining plateau would range from 12.7 A_0 to 22.5 A_0 μg/ml. This range would converge to approximately 17 A_0 μg/ml as the daily dose A_0 is distributed throughout the day. (Author abstract by permission)

74-0726. Propping, P.; Vogel, F. (Inst. Anthropol. Human Genetics, Univ. Heidelberg, Heidelberg, Germany). **Considerations of the problem of environment-induced mutations in man.** *Triangle 12(2): 49-55; 1973.* (31 references)

While a number of chemical agents such as pesticides have been shown mutagenic in simple test systems and/or in vivo in mammals, evaluation of their potential hazard to man is difficult. In microorganisms, but not in mammals, captan has been found strongly mutagenic; dichlorvos and formaldehyde have been found to be weakly mutagenic. Results must be obtained from mammals before any extrapolation to humans can be made. Differences between male and female germ cells and between germ cells at different stages of development should be investigated. The effect of single environmental contaminants on humans is much more difficult to determine than that of ionizing radiation, which is administered as therapy to a limited number of humans. Significant increases above the spontaneous mutation rate in the case of a protein variant could be monitored in large populations to determine a general effect.

74-0727. Schlicht, I.; Schulte-Hermann, R.; Koransky, W.; Eulenstedt, C. (Med. Klinik u. Poliklinik, Freie Univ. Berlin, Berlin, Germany). **Fremdstoff-induziertes Wachstum und Regeneration der Leber unter dem Einfluss von Hemstoffen des Arzneimittelabbaues. [Foreign substance-induced growth and regeneration of the liver and the influence of retarders of drug decomposition.]** *Verh. Deut. Ges. Inn. Med. 78: 1362-1365; 1972.* (16 references) (German)

The effect of CFT 1201 (β-diethylaminoethylphenyldiallylacetic acid hydrochloride) and SKF 525A on the hepatocyte mitotic and DNA synthesis-inducing action of α-BHC and BHT (butylhydroxytoluene) was studied in female Wistar rats with partial hepatectomy. Two hours before sacrifice the animals were given 0.5 mCi of tritiated thymidine for autoradiographic investigations. When administered alone, both α-BHC and BHT induce increased DNA synthesis and increased mitotic activity. When CFT 1201 is administered with α-BHC and BHT, the latter lose their inducing and mitotic effects completely. In animals treated with α-BHC or BHT and CFT 1201 or SKF 525A, the rate of thymidine incorporation in DNA, as well as the thymidine and mitotic indices, were comparable to those determined for the non-treated control. The blockade of the α-BHC BHT-, and phenobarbital-induced cell proliferation by such inhibitors as SKF 525 A and CFT 1201 may be due to the metabolism of these substances by cytochrome P450 into products which first induce DNA synthesis.

74-0728. Hofer, I.; Beck, T.; Wallnoefer, P. (Bayer Landesanstalt fuer Bodenkultur, Pflanzenbau and Pflanzenschutz, Germany). **Der Einfluss des Fungizids**

benomyl auf die Bodenmikroflora. [Effect of the fungicide benomyl on the soil microflora.] *Z. Pflanzenkr. Pflanzenschutz 78(7): 398-405; 1971.* (14 references) (German)

The effect of 30 and 300 ppm concentrations of benomyl and its hydrolyzate MBC (benzimidazole carbamic acid methylester) on the soil microflora in homogenized compost and in sandy soil was studied in a 4-month-experiment. The rate of nitrification decreased significantly although benomyl did not noticeably change the total number of soil microorganisms, the dehydrogenase, catalase, and amylase activities, and the rate of soil respiration. Benomyl exhibited fungistatic effect and caused the decomposition of organic substances in the soil by some fungicide-resistant fungi and other microorganisms. The metabolism, i.e., the respiration, of fungicide-sensitive fungi was more influenced by benomyl in a short time than the respiration of resistant fungi. There was no indication of benomyl decomposition by a great number of soil microorganisms. Some fungi of the genus *Penicillium* were able to incorporate benomyl in their mycelium.

See also **74-0529** **74-0551** **74-0572** **74-0573** **74-0579** **74-0587** **74-0591** **74-0618**

74-0729. Mueller, B. (Bienenschutzstelle der DDR, Bezirksinst. Veterinaerwesen, Potsdam, DDR). **Toxikologisch-chemische Untersuchungen an vergifteten Bienen. Uebersicht der Methoden zur toxikologisch-chemischen Untersuchung vergifteter Bienen. [Chemical-toxicological tests on poisoned bees. Review of methods for chemical-toxicological examination of poisoned bees.]** *Arch. Exp. Vet. Med. 27(1): 145-150; 1973.* (15 references) (German)

Highly sensitive methods suitable for qualitative and semiquantitative determination of pesticide residues in poisoned bees are reviewed. Organophosphorus and carbamate pesticide residues are determined by thin-layer chromatographic techniques based on cholinesterase inhibition in the bee brain. The chromatoplates are sprayed with a bee brain homogenate and incubated at 37°C. The cholinesterase inhibition is determined via the hydrolysis of β-naphthylacetate. Silver nitrate in alcoholic diphenylamine is used as the visualizing reagent for thin-layer chromatographic determination of organochlorine pesticide residues in the bee. Similar thin-layer chromatographic methods are applied for the determination of nitrogen-containing heterocyclic pesticides, substituted phenoxycarboxylic acids, and 2,4-dinitrophenols.

74-0730. Losch, K.; Weissflog, L.; Beier, D.; Schubert, W.; Mieth, K. (Bezirksinst. Veterinaerwesen, Wusterhausen/Dosse, DDR). **Untersuchungen mit Phosphorsaeureesterpraeparaten beim Rind, Schwein und Schaf unter besonderer Beruecksichtigung der Cholinesteraseaktivitaet. 1. Mitteilung: Die Bestimmung der Cholinesteraseaktivitaet im Blut von Rind, Schwein, Schaf und Pferd. [Action of organophosphorus preparations on cattle, pigs, and sheep, with special reference to cholinesterase activity. 1. Determination of cholinesterase activity in the blood of cattle, pigs, sheep, and horses.]** *Arch. Exp. Vet. Med. 27(2): 151-156; 1973.* (German)

A simple and sensitive method is described for the determination of blood cholinesterase activity, an important indicator of the systemic effect of organophosphorus pesticides, in cattle, pigs, sheep, and horses. Various methods used in human medicine were examined and a modified hydroxamic acid method was selected for veterinary use. Heparinized blood containing acetylcholinesterase substrate is combined with alkaline hydroxylamine and hydrochloric acid. Following filtration through Filtrak 389 filter paper, the filtrate is combined with ferric chloride solution. The extinction is measured at a wavelength of 490 nm at a path length of 1 cm within 120 min after the addition of ferric chloride. The acetylcholinesterase activity values obtained by this method compare favorably with those obtained by the Warburg method. The normal values of the acetylcholinesterase activity, obtained by the hydroxamic acid method for cattle, pig, sheep, and horse blood, are 1830, 1248, 822, and 3120 IU (International Units).

74-0731. Baker, B. E. (Fac. Agr., McGill Univ., Macdonald College P.O., Quebec, Province, Canada). **Confirmation of hexachlorobenzene by chemical reaction.** *Bull. Environ. Contam. Toxicol. 10(5): 279-284; 1973.* (4 references)

A method was developed for identification of hexachlorobenzene in the presence of BHC involving derivative formation, followed by GC analysis. Sodium ethoxide was added to mixtures of the pesticides in hexane. After refluxing for 4 hr, water and hydrochloric acid were introduced, and hexane extracts were prepared. This process converted BHC isomers to substances which did not interfere with the monoethoxypentachlorobenzene peak derived from hexachlorobenzene.

74-0732. Hellmann, H. (Bundesanst. Gewaesserk., Koblenz, Germany). **Gaschromatographische Bestimmung von gewaesserfremden Stoffen im Rhein. [Gas chromatographic determination of foreign substances in the water of the Rhine River.]** *Deut. Gewaesserk. Mitt. 15(6): 163-166; 1971.* (10 references) (German)

Procedures for the concentration, thin-layer chromatographic separation, and quantitative gas chromatographic determination of organic substances in water are discussed with special reference to the biocides endosulfan, parathion, and lindane. Concentration to a ratio of 100:1 is possible by successive extraction of biocides with carbon tetrachloride and trichloromethane and by subsequent centrifugal separation of the solvent-water phases. Groups of compounds are further separated on a silica gel layer with *n*-hexane and benzene as solvents for two different ranges of *Rf* values. A gas chromatograph with an electron capture detector, nitrogen as carrier gas, an injector block temperature of 250°C, and an oven temperature of 280°C are used for quantitative determination. The retention times obtained for parathion and lindane are 17.6 min and 14.3 min.

74-0733. Pohland, A. E.; Yang, G. C.; Brown, N. (FDA, Washington, DC 20204). **Analytical and confirmative techniques for dibenzo-*p*-dioxins based on their cation radicals.** *Environ. Health Perspect. 5: 9-14; 1973.* (16 references)

Visible and ESR (electron spin resonance) spectra were highly suited for confirmation of the presence of chlorinated dibenzo-*p*-dioxins in clean samples, provided pure standards are available. Trifluoromethanesulfonic acid was used as solvent for determination of visible spectra. Cation radicals absorbing in the 845-855 nm range were formed by oxidation with KNO_3 or irradiation with UV light. Although standards of highly chlorinated materials were not available, evidence strongly suggested that only those compounds substituted in the 2, 3, 7, and 8 positions will absorb at those wavelengths. Characteristic line widths and position of the resonance field relative to Fremy salt or dibenzo-*p*-dioxin were

used to identify isomers when ESR spectra of degassed samples of the dioxins irradiated by UV light were obtained.

74-0734. Crummett, W. B.; Stehl, R. N. (Anal. Lab., Dow Chem. Co., Midland, MI 48640). **Determination of chlorinated dibenzo-*p*-dioxins and dibenzofurans in various materials.** *Environ. Health Perspect. 5: 15-25; 1973.* (19 references)

GC-MS was the most sensitive and selective technique for the determination of chlorinated dibenzo-*p*-dioxins and dibenzofurans. Recovery of added 2,3,7,8-dioxin from 2,4,5-TCP and 2,4,5-T was excellent using this method. Samples were initally chromatographed on Dowex 21K hydroxide-form or Dowex MR-3 resin or on silica gel when necessary and then injected onto a GC column of 3% OV-210 on 80/100 Chromosorb W-HP or 3% SE-30 on 90/100 Anakrom ABS with a temperature of 235°. The GC was connected to a MS and quantitation was achieved by direct measurement of peak height of each isotope ion and comparison with standards.

74-0735. Baughman, R.; Meselson, M. (Harvard Univ., Cambridge, MA 02138). **An analytical method for detecting TCDD (dioxin): levels of TCDD in samples from Vietnam.** *Environ. Health Perspect. 5: 27-35; 1973.* (16 references)

A cleanup procedure was developed to eliminate interference by DDE and polychlorinated biphenyls in the MS assay of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) in animal tissue. Homogenized samples were treated with alcoholic potassium hydroxide and extracted with hexane. Hexane extracts were shaken with sulfuric acid and passed through columns of sodium carbonate and then chromatographed on alumina. Carbon tetrachloride-hexane was used to elute interfering materials, and dioxins were removed with dichloromethane-hexane. Preparative GLC was used to further purify the samples, and dioxins were eluted with benzene and analyzed by MS. Recovery from beef liver averaged 34%, but reproducibility and linearity were good. From 18 to 814 ppt TCDD were found in fish and crustacean samples collected in Vietnam in 1970. TCDD peaks were not observed in samples of Cape Cod butterfish.

74-0736. Frei, R. W.; Mallet, V.; Thiebaud, M. (Dept. Chem., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Quantitative determination of azinphosmethyl (Guthion) in blueberries by thin-layer chromatography and in situ fluorescence spectroscopy.** *Int. J. Environ. Anal. Chem. 1: 141-146; 1971.* (15 references)

A TLC method for determining azinphosmethyl in blueberries has given 85% recovery at the 0.5 ppm level and should be applicable to other crops and other organothiophosphates. The method involved chloroform partition followed by clean-up on activated florisil and separation on silica gel plates. Hexane-acetone was used to move the material, and spots were measured fluorimetrically after exposure to bromine and a reagent consisting of a 0.1% $MnCl_2 \cdot 4H_2O$ solution in 80% ethanol:0.05% salicyl-2-aldehyde-2-quinolyl-hydrazone in ethanol (2:1, v/v).

74-0737. Purkayastha, R. (Chem. Biol. Res. Inst., Canada Dept. Agr., Ottawa, Ontario, Canada). **Simultaneous detection of the residues of atrazine and linuron in water, soil, plant, and animal samples by thin-layer chromatography.** *Int. J. Environ. Anal. Chem. 1: 147-158; 1971.* (36 references)

Techniques for extraction, clean-up, separation by TLC, and determination of *s*-triazine (atrazine) and substituted urea herbicides (linuron) were developed. Alumina plates were used and the developing solvent was dichloromethane. Spots were detected by spraying the plate with ammoniacal silver nitrate reagent and irradiation under UV light for 5 min. When egg samples were to be assayed, a hexane partition, followed by florisil chromatography, was used to remove fatty material before TLC. The method was applicable to samples of eggs, blood, muscle, liver, corn plant, chicken feed, milk, soil, and water. Recoveries ranged from 80 to 92%.

74-0738. Bowman, M. C. (Entomol. Res. Div., Agr. Res. Serv., U.S.D.A., Tifton, GA 31794). **Determination and persistence of Bay 68138 and two of its metabolites in turf grass.** *Int. J. Environ. Anal. Chem. 1: 307-316; 1972.* (3 references)

A procedure which gave 95 to 105% recovery at the 0.1 ppm level was established for the determination of Bay 68138 (Nemacur P, phenamiphos) on turf grass. A Soxhlet extraction in methanol-chloroform was carried out under CO_2. The extract was evaporated to dryness, taken up in benzene, and chromatographed on a silica gel column. Phenamiphos, its sulfone, and its sulfoxide were determined by GC using a flame photometric detector. Total residues on turf grass from fields treated at 15 lb/A. declined from 4930 to 102 ppm dry weight in 49 days. Phenamiphos was less persistent than its oxidation products.

74-0739. Lawrence, J. F.; Frei, R. W. (Dept. Chem., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Analysis of carbamates as fluorescent 1-dimethylaminonaphthalene-5-sulfonate esters.** *Int. J. Environ. Anal. Chem. 1: 317-325; 1972.* (11 references)

N-methyl carbamates yielded two fluorescent spots when reacted with dansyl chloride in aqueous acetone and chromatographed on silica gel G using benzene-chloroform as solvent. NMR and IR spectra of carbaryl derivatives supported the conclusion that the

spot common to all *N*-methyl carbamates was the dansyl derivative of the methylamine moiety, a product of hydrolysis; the second spot was the dansyl derivative of the phenyl portion of the molecule. This type of derivative formation has considerable potential as an analytical tool. The dansyl derivatives have been formed with organophosphates and urea and triazine compounds. UV light caused degradation of the dansyl phenyl derivatives, making it necessary to carry out formation and chromatography in the dark for quantitative results.

74-0740. Lau, S. C.; Katague, D. B.; Stoutamire, D. W. (Shell Development Co., Modesto, CA 95352). **Characterization and microdetermination of a water-soluble metabolite from Bladex herbicide by conversion to 5,5-dimethylhydantoin.** *J. Agr. Food Chem. 21(6): 1091-1094; 1973.* (8 references)

A gas chromatographic method has been designed for the characterization and measurement of Bladex herbicide (cyanazine) and its various metabolites. It involves the simultaneous cleavage of the Bladex triazine ring and the cyclization of the characteristic Bladex fragment to 5,5-dimethylhydantoin. Measurement of the 5,5-dimethylhydantoin provides a quantitative assessment of the amount of Bladex and/or its metabolites present. This is readily accomplished by gas-liquid chromatography or by thin-layer chromatography. As an example, a procedure for the electron-capture gas chromatographic determination of a water-soluble metabolite derived from Bladex herbicide by conversion to 5,5-dimethylhydantoin is described. Following the procedure, 1 ng of the metabolite gives 25% full-scale response on the GC recorder chart. Recovery data from experiments run on crops and soil were generally in the 75 to 110% range when equal amounts of sample and reference solution in the same concentration range were analyzed. A sensitivity of 0.1 ppm is achieved in crops, and 0.02 ppm is achieved in soil and water. (Author abstract reprinted by permission of the American Chemical Society)

74-0741. Devine, J. M. (Lake Ontario Environ. Lab., State Univ. Coll., Oswego, NY 13126). **Determination of trichlorfon [*O,O*-dimethyl(2,2,2-trichloro-1-hydroxyethyl) phosphonate] in forest environmental samples.** *J. Agr. Food Chem. 21(6): 1095-1098; 1973.* (4 references)

A gas chromatographic method is described for the determination of trichlorfon in various forest environmental samples such as leaves, twigs, forest litter, soil, mud, water, aquatic vegetation, and animal tissues. Trichlorfon residues were removed with chloroform. Animal extracts were processed through hexane-water and water-chloroform partition steps to remove lipid materials. Forest extracts were cleaned up with Nuchar C-190N activated carbon. Determination of trichlorfon was made with a gas chromatograph equipped with a flame photometric detector in the phosphorus mode. Recovery from the various types of samples averaged 96%. The method is sensitive to 0.002 ppm for water and 0.05 ppm for all other sample types. (Author abstract reprinted by permission of the American Chemical Society)

74-0742. Su, G. C. C.; Price, H. A. (Michigan Dept. Nat. Resour., Lansing, MI 48914). **Element specific gas chromatographic analyses of organochlorine pesticides in the presence of PCB's by selective cancellation of interfering peaks.** *J. Agr. Food Chem. 21(6): 1099-1102; 1973.* (24 references)

Polychlorinated biphenyl interference-free qualitative and quantitative gas chromatographic (gc) analyses of β-BHC, oxychlordane, heptachlor epoxide, *p,p'*-DDE, *o,p'*-DDT, *p,p'*-DDD (TDE), *p,p'*-DDT, and mirex in the 10-25 ng range have been carried out in the presence of approximately 10 to 20 times their concentrations of Aroclors 1232, 1248, 1254, and 1260 by the use of the Coulson electrolytic conductivity detector in the noncatalytic reductive mode. No modification of the detector system was necessary except to set the detector's reactor temperature at 660°. The results on individual analyses in most instances were within ±20% of the actual value. (Author abstract reprinted by permission of the American Chemical Society)

74-0743. Domanski, J. J. Jr.; Nelson, L. A.; Sheets, T. J. (Dept. Entomol., North Carolina State Univ., Raleigh, NC 27607). **Regression techniques for estimating total DDT and TDE residues in tobacco.** *J. Agr. Food Chem. 21(6): 1111-1112; 1973.* (7 references)

A procedure is described for estimating total residues of DDT and TDE in tobacco from the analysis of only a single component of each insecticide. Linear regression equations were derived from data from previous analyses. Standard errors of the predicted values and the coefficient of simple determination (r^2) were calculated for each regression. Data from an independent source was substituted into the equation, and the calculated values were in good agreement with the observed values. The regression equations should prove useful in quality control monitoring for these insecticides on tobacco and tobacco products and should shorten the time for analysis considerably. (Author abstract reprinted by permission of the American Chemical Society)

74-0744. Balinova, A. (Author address not given). **Izpolzuvane na nyakoi aromatni amini kato proyaviteli pri tunkosloynata khromatografiya na triazinovi kherbitsidi. [The use of certain aromatic amines as visualizing agents in the thin-layer chromatography of triazine herbicides.]** *Khim. Ind. 44(9): 402-404; 1972.* (13 references) (Bulgarian)

The suitability of aniline, benzidine, dimethylaniline, diphenylamine, α-naphthylamine, *p*-phenylenediamine, *p*-toluidine, and *o*-tolidine as chromogenic reagents for the visualization of prometryne, simazine, and atrazine in the qualitative and semi-quantitative, thin-layer chromatographic analysis of the latter on Merck silica gel layer was studied. Distilled toluene and acetone in a ratio of 85:15 were used as solvent system, a 1:1 combination of 3% potassium permanganate and 10% of hydrochloric acid was the chlorinating mixture. The chromogenic reagents were used as 1% solutions in acetone or ethanol. Aniline, α-naphthylamine, and *p*-toluidine were found unsuitable for the detection of the herbicides, while diphenylamine, *o*-tolidine, and dimethylaniline were especially suitable. The lower limits of detection for prometryne, simazine, and atrazine using the suitable chromogenic reagents range from 0.5 to 1 μg.

74-0745. Thurm, V. (Wernigerode Hyg. Inst., Magdeburg, DDR). **Zu Notwendigkeit und Moeglichkeiten der toxikologisch-chemischen Ueberwachung fremdstoffkontaminierter Lebensmittel. 2. Mitt. Ergebnisse durchgefuehrter Untersuchungen im Rahmen des beschriebenen Ueberwachungssystems. [Necessity and possibilities for the toxicologic-chemical monitoring of contaminated foods. Part 2. Results of studies carried out within the framework of the monitoring system described.]** *Nahrung 17(2): 139-145; 1973.* (13 references) (German)

Experiences and results from residue analyses performed within the framework of a proposed pesticide residue monitoring system (abstract no. 74-0520) are described. Samples were analyzed from crops which presented a possibility of pesticide contamination according to the pre-harvest reports. Samples were extracted with chloroform, the extracts cleaned up by column chromatography, and the redissolved residues examined for organochlorines by thin-layer chromatography. Organophosphates were also detected by thin-layer chromatography, and if desired, could be determined semiquantitatively with enzymatic detection using a set of standards or by agar diffusion. Interfering plant components in the organochlorine determinations were eliminated by marking the spots under UV prior to spraying the plates with silver nitrate, or by using thicker silica gel layers. Detection of endosulfan and dicofol requires special column chromatographic cleanup, and procedural alterations are also necessary for toxaphene residues. Detection of dimethoate with thymol is unsatisfactory due to interfering plant components; 2,6-dichloro- or 2,6-dibromoquinone chlorimide is the preferred visualization reagent. Analyses revealed organochlorine levels exceeding tolerances in 13 of 83 suspect samples submitted for analysis and levels within the tolerance in 46. Organophosphates were not found at excessive levels, but were present within the tolerance in 4 of 30 samples. When random samples were examined, 12 of 104 samples contained organochlorines in excess of the tolerance; none had excess organophosphates. The usefulness of the proposed monitoring system is considered proven.

74-0746. Mueller, B. (Bienenschutzstelle der DDR, Bezirksinst. Veterinaerwesen, Potsdam, DDR). **Zur Bestimmung von Pflanzenschutzmittelrueckstaenden in Bienenhonig. 1. Mitt. Semiquantitative duennschichtchromatographische Bestimmung von Insektizid-Rueckstaenden in Bienenhonig. [Determination of pesticide residues in honey. Part I. Semiquantitative thin-layer chromatographic determination of pesticide residues in honey.]** *Nahrung 17(3): 381-386; 1973.* (13 references) (German)

A highly sensitive combination of thin-layer chromatographic and enzymatic techniques was selected for the determination of organophosphorus insecticides and carbamates in honey. When beef liver enzyme is used, the limit of detection with this method is in the nanogram range or lower; it is further lowered into the picogram range by the use of bee brain enzyme. Organochlorine pesticides such as DDT, lindane, and BHC are determined with a silver nitrate spray as the visualizing reagent, while toxaphene and α-chloropinene require alcoholic diphenylamine for detection on the silica gel layer. The respective limits of detectability for butonate, dichlorvos, dimethoate, methyl parathion, methyl paraoxon, trichlorfon, parathion, bromophos, mevinphos, and carbaryl are 0.1, 0.01, 100, 0.01, 0.10, 0.05, 0.00001, 0.01, 0.000001, 0.001, and 0.01 ng; while for DDT, BHC, lindane, toxaphene, and α-chloropinene they are 0.1, 1, 1, 5, and 5 μg.

74-0747. Mueller, B. (Bienenschutzstelle der DDR, Bezirksinstitut f. Veterinaerwesen Potsdam, Potsdam, DDR). **Zur Bestimmung von Pflanzenschutzmittelrueckstaenden in Bienenhonig. 2. Mitt. Semiquantitative duennschichtchromatographische Bestimmung von Herbizid-Rueckstaenden in Bienenhonig. [On the determination of pesticide residues in bee honey. Part II. Semiquantitative thin-layer chromatographic determination of herbicide residues in bee honey.]** *Nahrung 17(3): 387-392; 1973.* (German)

Nitrogen-containing heterocyclic compounds are determined by thin-layer chromatography using silver nitrate or Dragendorff reagent as visualizing reagents. Silver nitrate is also used for the determination of substituted phenoxycarboxylic acids. For the determination of 2,4-D derived compounds, the active agents are extracted with dilute sodium hydroxide. The nitro compounds are detected through reduction with tin (II) chloride and subsequent conversion of the amines to a yellow substance with *p*-dimethylaminobenzaldehyde. The limits of detectability of simazine, atrazine, propazine, amitrole, diquat, paraquat, 2,4-DB, 2,4,5-T butyl ester, DNOC, and dinoseb were 0.01, 0.05, 0.05, 20-30, 20-30, 0.5, 0.5, 0.1, and 0.1 μg.

74-0748. Raimann, H. (Hyg.-Inst. des Bezirkes Suhl, Gotha, DDR). **Zur duennschichtchromatographischen Bestimmung von Chlorpropham in Kartoffeln und Moehren. [On the thin-layer chromatographic determination of chlorpropham in potatoes and carrots.]** *Nahrung 17(4): 513-516; 1973.* (6 references) (German)

Test samples for TLC determination are homogenized for extraction of the chlorpropham residue with chloroform. The extracts from potatoes and carrots are purified by means of column chromatography and acetonitrile-hexane partitioning, respectively. Quantitative determination is done on thin layers of silica gel G, sprayed with ammoniacal silver nitrate solution, with subsequent UV irradiation. The residue level is determined semiquantitatively by comparison of chromatogram spots. The lower limit of detection is 0.1 μg chlorpropham. The rates of chlorpropham recovery from potatoes and carrots are 92±8% and 89±9%.

74-0749. Muthu, M.; Majumder, S. K. (Infest. Contr. Pestic., Cent. Food Technol. Res. Inst., Mysore, India). **A chromogenic column for determining phosphine in air.** *Pestic. Sci. 4(5): 707-711; 1973.* (9 references)

A 1% solution of mercuric chloride in 0.1% cresol red in ethanol, impregnated onto celite and filled into a glass tube [17.8 cm × 0.2 cm (i.d.)] could accurately determine even 0.06 μg phosphine in air. The samples were injected quickly through a rubber septum cap on the glass tubes under low suction. A red colored band developed instantaneously, the length being proportional to the concentration of phosphine. A calibration curve was prepared with known concentrations of phosphine. The concentrations present in a fumigation chamber were determined and compared with concurrent chemical analysis. There was close agreement between the two methods. A 1:3 and 1:6 mixture of phosphine and ammonia produced two bands, a yellow ammonia band preceding the red phosphine band. However, ammonia interfered with the proper development of the phosphine band. (Author abstract by permission)

74-0750. Edgington, L.; Buchenauer, H.; Grossmann, F. (Dept. Environ. Biol., Univ. Guelph, Guelph, Ontario, Canada). **Bioassay and transcuticular movement of systemic fungicides.** *Pestic. Sci. 4(5): 747-752; 1973.* (6 references)

A sensitive bioassay method was developed using bidirectional diffusion of fungicides in agar bands instead of diffusion through 360°. This method permitted the measurement of fungicide movement through isolated cuticular disks into agar bands underneath. Oil dispersible formulations of oxycarboxin and pyracarbolid penetrated through cuticles of coffee much more efficiently than wettable powder formulations. (Author abstract by permission)

74-0751. Beynon, K. I. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, ME9 8AG, England). **Gas-liquid chromatographic detectors and derivative-forming procedures for the selective and sensitive analysis of pesticides.** *Proc. Soc. Anal. Chem. 10(8): 203-204; 1973.*

The availability of a wide range of sensitive and selective detectors (including electron-capture, flame-photometric, micro-coulometric, conductivity, halogen-leak, emission-spectrometric, and plasma systems) together with MS operated in the selective ion mode has led to extensive use of GLC in the quantitative determination of pesticide residues. Confirmation of identification is often achieved through the use of several detectors in series. Procedures have been developed for conversion of compounds not sufficiently volatile for GLC or lacking detectable functional groups to derivatives which can be analyzed by GLC.

74-0752. Edwards, M. J. (I.C.I. Plant Protection Ltd., Jealott's Hill Res. Station, Bracknell, Berkshire, England). **The determination of pesticide residues in food crops.** *Proc. Soc. Anal. Chem. 10(8): 206-208; 1973.* (7 references)

An analytical method for the determination of pesticide residues contains a number of steps; the success of the method depends on the reliability of each phase. Correct sampling and sub-sampling have not been standardized, but freezing helps to minimize volatilization and/or degradation during transportation and storage. Extraction of the pesticide is often accomplished with a mixture of a polar water-miscible solvent and a nonpolar water-immiscible solvent. Liquid-liquid partition and column chromatography are the most widely used clean-up procedures, but TLC, sweep co-distillation, and others can be implemented also. Electron-capture GC is extremely sensitive for determination of organochlorines and GC with flame photometric and thermionic detectors is now being applied to the determination of organophosphates and carbamates. Rubidium bromide detectors have been successfully used for hydroxypyrimidine fungicides.

74-0753. Blass, W.; Voss, G. (Division Agrarchemie, Ciba-Geigy AG, Basel, Switzerland). **Ein Chlorella-Biotest zur Bestimmung photosynthesehemmender Herbizide in Boeden und Gewaessern. [A chlorella bioassay for determining photosynthesis-inhibiting herbicides in soil and water.]** *Schriftenr. Ver. Wasser-Boden- Lufthyg. Berlin Dahlem 37: 21-30; 1972.* (8 references) (German)

Photosynthesis-inhibiting herbicides, such as urea and triazine derivatives, can be determined qualitatively and quantitatively by the Warburg method, measuring the oxygen production by non-sterile *Chlorella pyrenoidosa* cultures. The cultures in soil and water are kept at 27°C under a steady stream of carbon dioxide. Diuron, chlorbromuron, and chloroxuron cause 50%

inhibition of *Chlorella pyrenoidosa* (I50) at 0.03 ppm, and an I50 value of 1.2 ppm was determined for fenuron. The I50 values for simazine, atrazine, ametryne, terbutryne, and etazine are in the order of magnitude of 0.1-0.2 ppm. Photosynthesis-inhibiting metabolites of these urea and atrazine derivatives can be also detected by this bioassay. The lower limit of detectability for these herbicides is about one fifth of the respective I50.

74-0754. Soerensen, O.; Althaus, H. (Hyg. Inst. des Ruhrgebietes, Gelsenkirchen, Germany). **Automatische Feststoffdosierung beim gaschromatographischen Pestizidnachweis. [Automatic addition of solids in gas chromatographic detection of pesticides.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 39-44; 1972.* (13 references) (German)

A procedure has been developed for the automatic injection of pesticide samples on solid carriers, such as steel coils, for gas-chromatographic detection. The solid carrier is placed in an evaporator block into which the test samples are injected. The rapid evaporation of the solvent results in the absence of solvent peaks and in increased reproducibility as compared to the direct injection method. To automate test sample injection the test tubes are placed in a vertical, motor-driven, controlled-advance evaporator block with water cooling. Sample losses due to volatilization within the evaporator block do not occur during hold times up to 8 hr. While this automatic solid injection technique is highly suitable for the analysis of such pesticides as tributylphosphate, disulfoton, parathion, and aldrin, it can not be applied to DDVP (dichlorvos) due to its rapid volatilization.

74-0755. Korte, F. (Organisch-Chemisches Inst., Bonn Univ., Bonn, Germany). **Zur Frage der automatischen Trendbestimmung von halogenhaltigen organischen Umweltchemikalien in Trink- und Abwaessern. [Automated determination of trends in halogenated organic pollutant levels in drinking and waste waters.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 45-49; 1972.* (1 reference) (German)

Automated qualitative and quantitative determination of halogenated organic compounds, including organochlorine and other halogen-containing pesticides, can be used to detect long-term trends in drinking water and waste water quality. Following automatic water sampling and filtration, the water samples are treated with *n*-hexane to extract the organic halogen compounds according to the Kahn-Wayman method. The rate of agitation is optimized for the quantitative separation of *n*-hexane from water and for a pesticide recovery rate of 97%. For waste waters contaminated with oil and grease, cleanup of the extract on deactivated alumina column is required. If necessary, the extract is evaporated continuously for identification of the individual components in an electron-capture detector. The total halogenated organic content is determined with a ^{63}Ni electron-capture detector in a gas chromatograph, using a injection rate of 0.2 ml/min, an injector block temperature of 270°C, a column temperature of 280°C, detector temperature of 300°C, helium at a flow rate of 80 ml/min as carrier gas, and 10% methane in argon at a rate of 250 ml/min as flushing gas. The lower limit of detectability lies in the ppb range.

74-0756. Frimmel, F. (Inst. f. Wasserchem. und Chem. Balneol., Tech. Univ. Muenchen, Munich, Germany). **Zur Analytik der Pestizide im Wasser. VI. Mitteilung. Koppelung von Gaschromatograph und Massenspektrometer bei der Analyse von Pestiziden im Wasser. [Analysis of pesticides in water. Part 6. Coupling of gas chromatograph and mass spectrometer in analysis of pesticides in water.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem 37: 51-58; 1972.* (5 references) (German)

The suitability of gas chromatograph-mass spectrometer combinations for the identification of pesticides in water is demonstrated using the example of DDT and parathion. In addition to the qualitative investigation of such substances in water, gas chromatograph-mass spectrometer combinations also permit the quantitative determination of pesticide residues in the pg range through mass-specific adjustment. An additional capacitor in front of the detector slit of the mass spectrometer, in association with a peak display unit, furnishes optimum information at maximum sensitivity. Studies of pesticide metabolites and metastable fragments will be among the major applications of gas chromatograph-mass spectrometer combinations in the future.

74-0757. Frostling, H. (Res. Inst. Nat. Defence, Dept. 1, S-172-04, Sundbyberg 4, Sweden). **Continuous detection of vapours and aerosols of organophosphorus compounds by flame ionization-flame emission.** *J. Phys. E 6(9): 863-867; 1973.* (16 references)

An inexpensive instrument has been developed for the continuous, specific determination of organophosphorus compounds in the form of vapors or aerosols. A flame ionization detector was modified so that the hydrogen flame could also be used as emission source for a flame photometric detector. The photomultiplier tube was shielded from the main part of the flame, and a narrow bypass interference filter was included for spectral isolation of the phosphorus emission at 526 nm, allowing specific detection of organophosphorus compounds. Low noise level and good background stability were achieved by means of cooling baffles and a light conducting rod of quartz, which kept the photomultiplier tube and the interference filter at room temperature. Trimethyl and triethyl phosphates, diisopropyl phosphite, triisopropyl phosphite, diethoxymethylphosphine oxide and ethoxy ethiomethylphosphine oxide were used to calibrate the instrument. The sensitivity obtained for the organic phosphorus compounds

was 0.38 μA per g-atom P 10^{-4}, and the lowest detectable concentration was 0.01 X 10^{-4} g atom P m^{-3} or about 0.15 mg m^{-3} for most of the materials.

74-0758. Goswami, K. P.; Green, R. E. (Dept. Agron. Soil Sci., Univ. Hawaii, Honolulu, HI). **Simultaneous extraction of hydroxyatrazine, atrazine, and ametryne from some Hawaiian soils.** *Soil Sci. Soc. Amer. Proc. 37(5): 702-707; 1973.* (15 references)

A simple procedure is described for simultaneous extraction from soil of 2-chloro-4-ethylamino-6-isopropylamino-*s*-triazine (atrazine), 2-methylthio-4-ethylamino-6-isopropylamino-*s*-triazine (ametryne) and their common hydrolysate (hydroxyatrazine = HA). The procedure involves extraction by shaking in acidified methanol, centrifugation, and subsequent quantitative separation of HA from the parent triazines by liquid-liquid partitioning. The pH of methanol was adjusted with 4*N* HCl to obtain a final pH of 2.5 in the soil extract, using a 1:10 soil/solvent ratio. HA recovery with one extraction was 94% for both Molokai (Typic Torrox) and Hilo (Hydrandept) soils having soil extract pH values of 2.4 and 3.4, respectively. In all cases, atrazine and ametryne were quantitatively recovered in soil extracts. After protonation HA was quantitatively separated from the mixture of HA and atrazine or ametryne by partitioning in an aqueous methanolic soil-extract/chloroform system when the water/methanol extract ratio was 1.25. HA extraction from soil was extremely pH dependent. Dissolution of calcium chloride in acidified methanol decreased recovery of added HA from 94% to 76% for Hilo soil, but had no effect on % HA recovery from Molokai soil; the electrolyte was found to increase the pH of Hilo soil extract, a result of the net positive charge of this soil at low pH. The recovery of added HA from Ca-montmorillonite was 33%, suggesting that the procedure may be less suitable for soils with high permanent negative charge. (Author abstract by permission)

74-0759. Sedov, A. I. (Donetsk Regional Bureau Forensic Med., Donetsk, USSR). **Opredeleniye sevina i 1-naftola v trupnom materiale metodom tonkosloynoy khromatografii. [Determination of sevin and 1-naphthol in cadaverous material by thin-layer chromatography.]** *Sud.-Med. Ekspert. 16(1): 41-44; 1973.* (Russian)

A combined thin-layer chromatographic and photocolorimetric method can be used for qualitative and quantitative determination of Sevin (carbaryl) and its principal metabolite, 1-naphthol, in cadaver tissues. Following pesticide extraction with benzene from stomach, liver, intestine, or other tissue, a rapid test is performed, based on the reaction of carbaryl with picric acid or 4-aminoantipyrine plus nitrosation. If the result is positive, the pesticide is determined by chromatography on an anhydrous alumina layer using chloroform-benzene-acetone (7:2:1) as the solvent system. Spots are visualized with sodium cuprobromide and an alkaline solution of diazotized sulfanilic acid. The spots are eluted from the alumina layer with methanol for colorimetric determination based on the reaction of carbaryl with 4-aminoantipyrine. The limit of detection is 50 μg of carbaryl or 1-naphthol.

See also **74-0548** **74-0563** **74-0576** **74-0691**

PESTICIDES ABSTRACTS

QUARTERLY INDEX

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PREFACE

The basic design for this index was supplied by the Technical Services Division, Office of Pesticide Programs, Environmental Protection Agency. It consists of two subject indexes (concept and compound) and two author indexes (personal and corporate). Primary and secondary headings in the Concept Index appear as subordinate headings in the Compound Index, both indexes having three levels of specificity.

In the Concept Index, only general aspects are indexed under the broader terms shown below. For specific terms, the reader should consult the appropriate heading in the Concept Index, selecting the narrower term that best fits his need.

Compounds are indexed by their common names; where other compound designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under the broader headings (e.g., organochlorines, herbicides, etc.).

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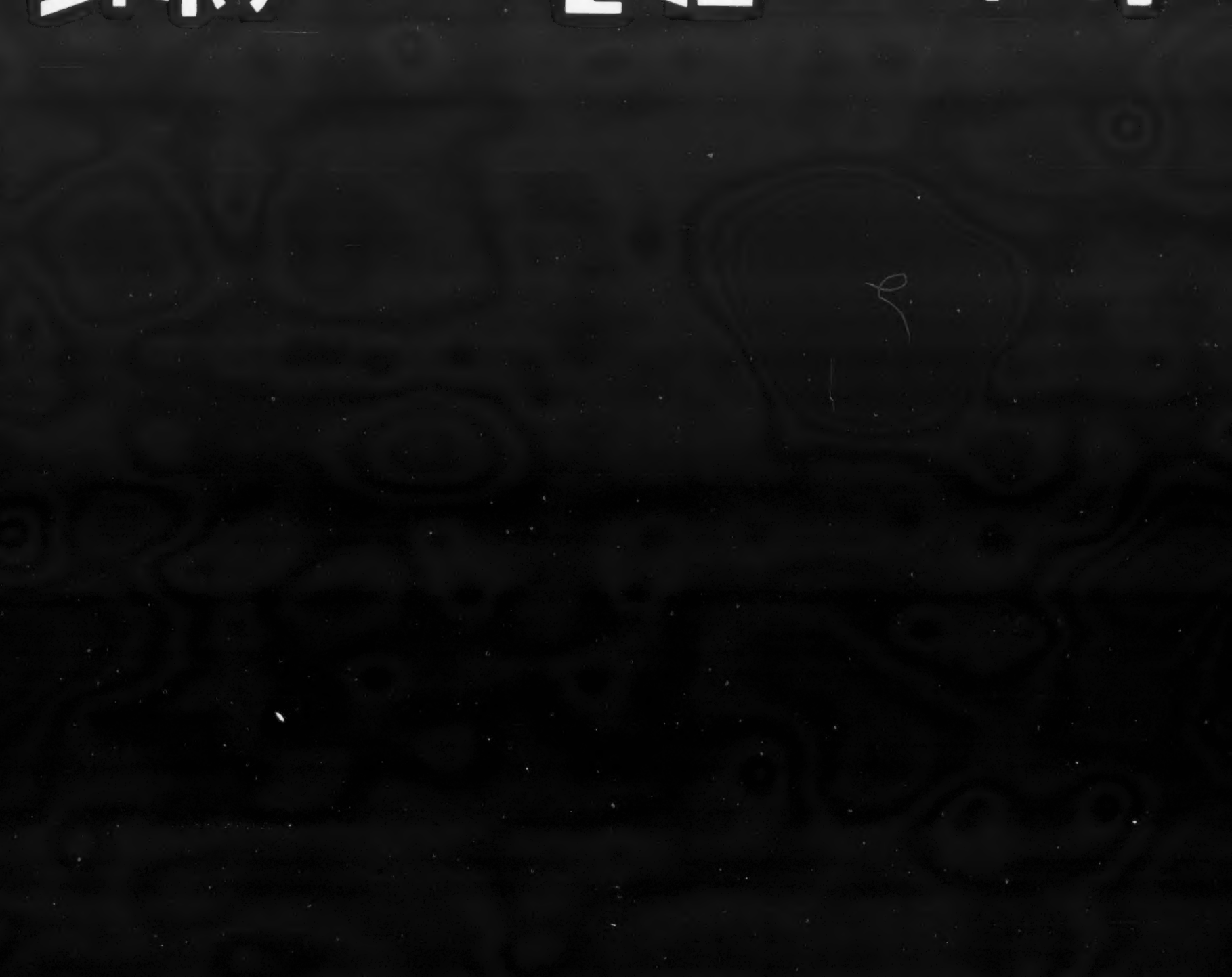
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